ELECTRICAL REVIEW

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Telephone Legislation in Indiana.

THE LAW LIMITING TELEPHONE CHARGES REPEALED BY A VOTE OF TWO TO ONE.

To the Editor of Electrical Review:

The telephone rate law, passed by the legislature four years ago, limiting the charges for the use of telephones, has been repealed by the present General Assembly, by a vote in each house of nearly two to one.

The effect of the law has been disastrous not only to the telephone companies operating in the State, but also to the general public, and particularly to that portion of the business interest whose need of telephone facilities is greatest, and in response to whose petitions the repealing act was passed.

Under the operation of the law which has been repealed, fully two-thirds of the telephone exchanges in the State and one-half of the stations were closed, and what service was rendered was only by treating the law as a dead letter and evading its provisions.

No extensions or improvements of telephone lines or service have taken place under the law, and the many improvements in the art since 1885, which are in use elsewhere, have been, by its operation, kept out of Indiana.

The repeal of the law without any restrictions, leaves the question of compensation for service to contract between the people and the telephone companies.

The Central Union Company, which controls the greater portion of this State, says that it will now reorganize its business and do away with the obnoxious toll system, by means of which the law has been evaded, and re-establish its business upon the basis used before the passage of the law, and furnish service as good as the best.

Supt. Hockett and the employés of the Central Union who have witnessed and borne the bad effects of the law for four years, are highly gratified with its repeal, and express great hopes of the telephonic future of of Indiana. ELECTRIC.

Indianapolis, Feb. 27, 1889.

A Word from the President of the Edison Electric Light Co.

To the Editor of Electrical Review:

Will you please amend our advertisement by substituting the word "main" for "sole" on the head line reading "completely depriving the defendants of their sole defence.' My attention having been called to the several statements made in this advertisement, I have carefully perused it and find with the above exception they are properly expressed and substantiated by the facts Having thus disposed of the only error in the notice by frankly admitting it, I leave to others the definition of the word "sustaining." Yours very truly,

EWD. H. JOHNSON, *President.*

New York, Feb. 28th, 1889.

Electrical Matters in Montreal, Canada.

Montreal is now assuming quite a metropolitan air, and while assuming that must needs build great buildings, and of course illuminate them with electric light.

Notable as a large building, is the new New York Life Insurance Company's building on Place d'Arms Square. It will be lighted by the Brush system, and 800 lamps will be installed. To run the plant two Mackintosh and Seyman compound engines will be placed.

Another and notable building is that of the Methodist Society erected on their old church site on St. James street. It has been wired by the Edison Company for 675 lamps.

The Imperial Insurance Company are remodelling the Consolidated Bank building and have had the Royal Company wire the building for 500 or 600 lamps.

The New Canadian Pacific Railway station will soon have some 800 lamps running to light that establishment, put in by the Royal Company. The Grand Trunk Railway building has been wired for lighting, some 700 or 800 lamps being required.

The Federal Telephone Company are preparing to commence operations as opponents of the Bell Company. During May they will use the Law Metallic circuit system.

Telephone Legislation in New York State.

Mr. Hamilton's bill providing for the reduction of telephone charges to $6 a month in New York and Brooklyn, and $3 in other parts of the State, came up for consideration before the committee on general laws last week. Mr. Cutler, representing the New York and New Jersey Company, said his company operated in Brooklyn and other Long Island towns, and its property was mostly in Brooklyn. Recently a new switchboard costing $20,000 was placed in the central office in Brooklyn, which would not have been done had the intention of the legislature to reduce the fees been known. Mr. Cutler thought the passage of the proposed law would not be in the interest of the public. People who use the telephone are those who do the largest business. About one in every 200 uses the telephone. If others than patrons want the services of the telephone they can procure it for 15 cents. No rate could be mentioned that would bring it within the reach of every one. The charges in Brooklyn were from $60 to $210 a year, based on mileage, and $300 with privileges of talking with New York whenever desirable. The $120 rate to the business men is smaller in comparison than the $60 is to the residence subscriber. One subscriber having a $360 rate had just 7,200 communications in New York City, which was but two cents a call with the Brooklyn service free. A large force of operators has to be kept in constant attendance. His company pays a dividend of six per cent. The committee took no action.

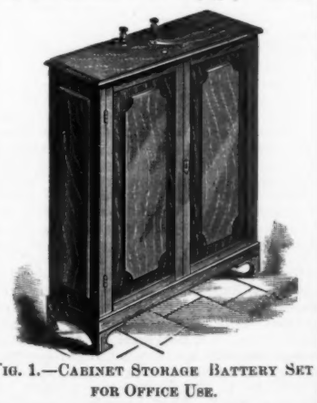


FIG. 1.—CABINET STORAGE BATTERY SET FOR OFFICE USE.

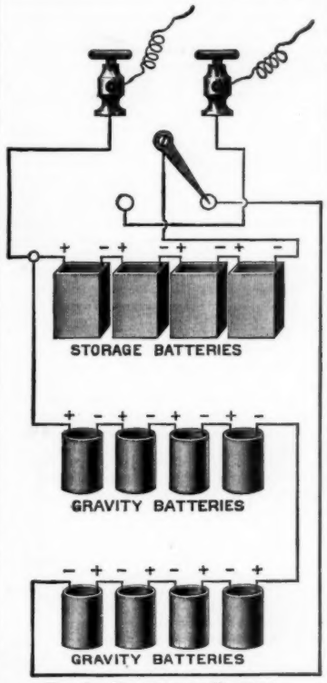


FIG. 3.—DIAGRAM OF CIRCUITS.

The Fort Wayne Jenney Company has just shipped to the Pacific coast the biggest order since the fire. The consignment is to the California Electric Improvement Company, and consists of four large dynamos, with converters, lamps, sockets, etc., enough to make up an order of $100,000. The merchandise filled four cars, and filled them cleverly. The Fort Wayne Jenny Electric Light Company has lately taken a contract to light the Palace Hotel in San Francisco with 5,000 incandescent lamps.

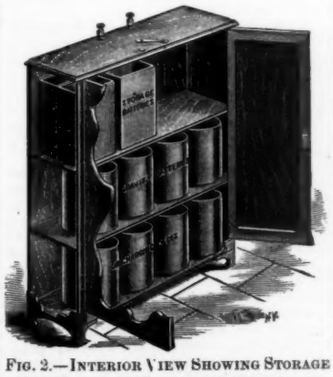


FIG. 2.—INTERIOR VIEW SHOWING STORAGE BATTERY AND PRIMARY BATTERY FOR CHARGING.

Storage Battery Cabinets.

Mr. J. A. Seeley, electrician of the Metropolitan Telephone and Telegraph Company, is the inventor of various improvements in storage battery applications. They consist in the arrangement of the jars in compact form, in attractive cabinets, which are ornamental wherever placed, and with every attention given to convenience in handling. The accompanying illustrations show: Fig. 1, an exterior view of a cabinet set for storage battery office work; Fig. 2, the cabinet interior, showing the position of the storage batteries and also the primary batteries for charging. Fig. 3 is a diagram showing clearly the arrangement of circuits. Fig. 4 shows an exterior view of a physician's set, this compact little box containing three storage cells and rheostat. The Complete Electric Construction Company, of 18 Cortlandt street, who have the agency of the Electrical Accumulator Company for storage batteries for small isolated plants, are handling these goods, and will undoubtedly strike a popular field.

FIG. 4.—PHYSICIAN'S STORAGE BATTERY SET.

A Singular Telegraphic Blunder that Embarrassed a Bachelor.

One of the well-known members of the Electric Club of New York is Mr. A. F. Stanley, a gentleman whose retiring disposition, it is supposed, has, up to the present, kept him a single man. A few days ago, while recuperating from the fatigue of attending the Chicago Convention of electric light men by visiting a pretty little village near New York where he had discovered a special attraction, he received a startling telegram, which caused each individual hair to stand on end and filled with horror his heart of hearts. The telegram read as follows, and was signed by an acquaintance:

"Meet Rosa at Electric Club Monday evening with idea. If going, telegraph me what time."

The feelings of Mr. Stanley upon the receipt of the above, with his surroundings so considered, may be imagined. He at first decided it was a joke played on him by the New York friend. He hastened into the city to discover the perpetrator and visit him with the condign punishment that such an act merited. The original telegram was traced up, and then the whole matter was explained. It read as follows, and had been sent with reference to a proposed trip:

"Meet Ross at Electric Club Monday evening with idea of going. Telegraph me what time."

The joke was so good it leaked out. Lieut. H. S. Ross, U. S. N., was the gentleman who passed for "Rosa." We do not remember ever to have seen so complete a change of meaning in a telegram with so slight a change in its wording. Armed with the original telegram we have no doubt that Mr. Stanley has been able to regain his former position in the minds and hearts of his friends in the said pretty little village, where the contents of the telegram received had promptly leaked out, as so often happens in country towns.

Electric Light Stations and Fire Risks.

BY S. E. BARTON, OF BOSTON, BEFORE THE NATIONAL ELECTRIC LIGHT ASSOCIATION, CHICAGO.

By reason of faulty work which crept in during the early stages of electric lighting in Boston, numerous small fires which have occured there have created a scare among insurance men, causing a threatened increase in rates unless a remedy was applied. The following notice just issued by the Boston Board of Underwriters indicates where they look to for relief.

"At a meeting of the Underwriters' committee, held January 28th, 1889, it was voted that on and after May 1st, 1889, all electric lighting and wiring companies' men, who are in any way responsible for any of the wiring, running of dynamos, or care and management of batteries for electric lighting, must hold a license from the New England Electric Exchange. This rule applies to isolated plants and central stations alike, and is imperative. No exception to it will be made."

Such a rule may seem arbitrary to anyone not in sympathy with the objects sought by the "Exchange" (and there will always be found some objectors to any good movement), but after all I believe it is just the medicine needed for the complaint.

In regard to the Electric Light Generating Station, the situation is not a pleasing one to either party. Out of over 200 fire insurance companies doing business in Massachusetts, the electric light station is a prohibited risk with all but about 25 or 30 of them. The reasons for this interdiction are chiefly these: First, because electrical apparatus, and dynamos in particular, have been found to be very susceptible to large and uncertain damage in cases of small fires; secondly, because generating stations have too frequently been crowded into very hazardous and improper quarters, simply to get floor space and power at the smallest cost, without regard to permanency and ultimate results; lastly, and mainly, because insurance men, as a rule, do not understand the nature of the hazard, and often fail to get enlightenment from those in charge of stations. Therefore, a large majority of the companies adopt the course of all wise underwriters—they "take the benefit of the doubt," and leave your station risks alone.

Judging from my own observation of the way in which electric light station risks are peddled about to find takers, and the rates that are charged by reason of there being so few takers, I am led to believe that the question of insurance is to many of you an unsatisfactory one. I cannot help thinking that, even with the present condition of stations as fire risks, if the business as a whole were so classified as to show the aggregate premiums on the one side, and the losses and expenses of doing the business on the other, a fair margin of profit would be shown. But no such general classification or account is made, and the experience of those few companies that venture on your risks, if favorable, is carefully kept to themselves, so that others may not be induced to venture.

Perhaps a bureau of the National Electric Light Association might be formed, the purposes of which would be to collect information as to the aggregate premiums paid and losses incurred in central station insurance. If such a labor should demonstrate that a fair profit remained after deducting gross losses and expenses from gross premiums, probably modified rates, and a freer acceptance of risks, would follow. If it demonstrated that the present high rates of premium yielded no profit to those companies insuring your plants, then you would be convinced of something radically wrong, and you would have before you a field for investigation and a work of much needed reformation.

Maybe an Electric Light Mutual Fire Insurance Association would solve the question; but such a step should be taken with caution, and should be guided by those well-founded principles and practices that have proved so successful with the Manufacturers Mutual Fire Insurance companies of New England, and of which Mr. C. J. H. Woodbury (well-known to many of you), is a prominent officer. No risk should be accepted by such an association until improved to a certain standard as a fire risk, and then regular quarterly or tri-yearly inspections should be made, to see that the standard of equipment and care in operation were maintained. Much valuable information as to improved modes of construction and equipment could be disseminated by such an association, or even by your own association.

In some such general way as I have suggested, the question of central station insurance can be settled; but while the present tendency to temporary or makeshift installation shall continue, the question will hardly reach a satisfactory solution. Surely, the capital invested in generating plants would seem to warrant some general action looking to the standardizing and maintenance of them, and their insurance at a moderate cost.

In the latter part of last year, I was informed by your secretary, Dr. Garratt, that at this Convention "the subject of insurance in relation to electrically-illuminated buildings, and also the question of electric light stations as fire risks" would receive attention, and I was asked by him to prepare a short paper on one of these subjects.

I wish first to acknowledge the honor I feel in being invited to speak before so scientific and large an assembly as this Convention of the National Electric Light Association.

Through stress of circumstances my paper will be short, but I wish to touch both subjects in a general way.

Insurance companies, like yourselves, sometimes get involved in litigation, and it is my unhappy lot to have been drawn into that unfortunate condition, to the exclusion of almost everything else, for the past two months. I offer this information as a preliminary apology for what may follow. Perhaps my misfortune in being caught in the toils of the law may prove to be your good fortune, because I am full to overflowing of the subject before me.

I cannot refrain, in the outset, from congratulating myself, and my insurance associates in New England, upon the very cordial relations existing between ourselves and the electric lighting interests, and also upon the very favorable experience the underwriters of New England have met with in having comparatively little loss to pay on account of the electric lighting fire hazard. Nor can I refrain from saying that, as favorable as our experience has been in the past, it is being, and will continue to be, made much more favorable through the good work undertaken, and being carried on through the New England Electric Exchange. Its influence and results tend in the right direction—to the education of those employed in electric lighting pursuits as to what practices and work are safe and what are not, and to the exclusion from such pursuits of any who may, through lack of proper scientific knowledge, be unqualified for the positions they hold.

As a matter of fact, however, I believe that the experience has been, that because men have been required to provide themselves with a license certificate as to their qualification, they have speedily and earnestly set themselves to work to gaining the necessary technical knowledge to qualify them to receive the certificate. It goes without saying, I think, that those men are thereafter more capable in their business, and safer men for all parties concerned than they were before.

At the risk of giving voice to trite expressions, I am going to reassert that I believe we are all agreed that there is no element or force with which we deal that is more capable of self-control than the one which called into existence this association, nor is there one prolific of danger or hazard in more ways when unscientifically and carelessly handled.

Now then, having on the one hand an element so fraught with hazard, and on the other one so easy of control, your duty is obviously to do all you can by your own work to promote and secure safety, and to encourage all feasible plans and efforts of others tending in the same direction. While the plain duty of underwriters in the public interest is, first to hold to a strict line of requirements any of you who may be tempted or compelled, through competitive pressure, to depart from what you know are safe practices, and, having done that, the underwriters' duty is not fulfilled until they have indorsed electrical illumination and power by the reduced premium charges that such combined action on the part of electrical and insurance interests is sure to warrant.

The two interests are peculiarly identical. Hand in hand they can accomplish much in reducing the enormous fire waste. Disunited and antagonistic to each other, your work will be slower in development. Competition among yourselves and no restraining supervision on our part will drive you to cheaper construction and maintenance of your work. More fire loss and higher premiums for insurance must inevitably be the result, while the public, still calling for your light because it is good, will be deterred to an injurious degree by reason of the increased insurance rates that will surely follow, such as have already been applied in some cases, and threatened in others.

The policy of insurance companies and organizations toward electric lighting or any hazard in fact, capable of being minimized, should not be "to fit the punishment to the crime," but rather to lessen the crime, or endeavor to. In your case they will be loth to undertake that policy without your co-operation, and can succeed only with it. Without their co-operation, I think you would make but little headway in that direction.

In New England electric lighting is very popular with insurance men, particularly since it has, as applied to some risks, been included in the schedule of "improvements" for which a reduction in tariff is made. The energetic agent in his efforts to scoop in his competitors' pet risks does not fail to recommend the introduction of electric lights as a means of procuring a lower rate and securing the risk to himself. He thereby becomes your solicitor. He goes still further; in many cases he manifests his favor to you and serves his own interests by becoming an investor in your apparatus, and a promoter of your industry. Such a condition of things is but the natural outgrowth of a perfect harmony and co-operation between the two great interests. It ought to exist throughout the land.

DISCUSSION OF MR. BARTON'S PAPER.

Mr. Morrison: Just one word. I want to add my voice to one particular point. I want particularly to call attention to that part of this very able report in which the lamentable condition of many of the electric light stations of this country, the occupancy by electric light companies of old tumbled down buildings or any other place that they can poke apparatus into, at the least cost, is doing more harm to the electric light business than all its antagonists put together. The one declaration made in that paper that the insurance companies of New England have been compelled to abandon the risks of electric light stations is a sufficient warning to all those about to engage in that business that the only proper course to pursue is to erect substantial stations under intelligent supervision and that a law ought to be passed in each state of this Union where electric lighting is proposed, placing such construction under the supervision of the government. The suggestions made in the paper with regard to obtaining such and such information will, I have no doubt, be carefully noted by our secretary, who, before this and the next meeting will doubtless, together with other information which he expects to gather for us, furnish information on that subject. It is a matter of the greatest importance. It is one that touches your pocket nerve and when you touch that you touch the most sensitive part of any man who has any capital engaged in the business.

Mr. Barton: I would like to state still further that it not only touches your pocket, but I am free to suggest it touches my heart to see what I believe to be one of the safest classes of risks that we can have (Applause), at the present time, through no reasonable excuse whatever in such a condition that insurance companies will not touch them as a general rule. I believe that in our business generally about 25 per cent. of the loss may be charged to what is known with us as moral hazard. I hold that that whole 25 per cent. is eliminated from the electric lighting hazard; there is no such thing as moral hazards. (Applause.) Therefore I say when we can have a class of risks with that one risk entirely wiped out, it does seem a shame and a pity that we cannot have the class so raised physically as to make it desirable for insurance companies at low rates. The present condition is due wholly, I think, to the fact of inconsiderate construction without regard to any permanency of the future condition, but simply to get a station at the least possible first cost. The matter is receiving considerable attention now in New England, and only recently, within the last two weeks, the electric light committtee, of which I am the chairman, has been asked by the New England insurance exchange to formulate a schedule for the purpose of making tariff rates upon central stations. Heretofore it has been done by the various committees and has been out of the control, or not in the control of the electric lighting committee in any degree—the question of making rates. They have been rated at what we call the flat method of rating without any regard to the real merits or demerits of the risk. We are now undertaking to formulate a schedule such as we have been asked to in which we shall assume a standard model risk at a very low rate. We shall then add in the way of deficiency which we shall make a special charge for, those features which we believe contributes to the making of a central station a poor risk, and which can be eliminated by changing and it will be largely in the method of construction, internal as well as external, of modern fire appliances and of the arranging of switchboards and things of that kind. So that we hope in a very short time to get a schedule formulated whereby electric light people can have some idea of what we as insurance men think should be done in order to improve your risks, and that will be put into general operation in New England and I should hope it would spread. I know for certain New York State and the New York City associations will adopt it as soon as we have issued it, and therefore it looks as though the insurance of central stations in the eastern part of the country is in a fair way to reach some sort of a solution, but still it lies in your hand, gentlemen, to make it what it should be, and it would remove very largely the feeling of prejudice that usually extends from the insurance companies to the public. When it becomes known, as it is generally known, that electric light central stations are so hazardous that insurance companies will not touch them, it will only go to increase the public interest against electric lighting in general. They infer from that standpoint that there is something so mysterious and something excessively hazardous about it that they do not want any of it.

A Letter from Mr. David Brooks.

TO THE EDITOR OF ELECTRICAL REVIEW:

In your issue of this week there occurs the following passage in the article headed "Underground Electrical Conduits:" "The first effort to construct an underground conduit for electrical wires, following upon the *Brooks' fiasco*, was in 1882."

The only underground conductors that I ever laid for practical use were in London in 1880, for the British Post Office Department, now nine years since.

A letter from Mr. W. H. Preece, Chief Government Electrician, dated General Post Office, London, 15th January, 1889, inviting me to come to London and "thoroughly discuss" any improvements I have made, incidentally refers to that work in 1880, in the following words: "Your wires down the Southwestern are still at work, and I have not heard of any trouble with them." Now, the improvements consist of a new system laid on the Pennsylvania Railroad about 20 months since, and have been working without an interruption to a single conductor, 53 in number, over a mile and a third. The original American patent was sold in 1881. Now, if these are *fiascos*, I beg to state that the Johnstone conduits, and every other conduit laid in Philadelphia, are perfect successes. Some call them white lead factories, some, modern exploders, and any one coming to Philadelphia can see them pulling out cables every day. Yours, etc.,

DAVID BROOKS.

Philadelphia, Feb. 21, 1889.

The Wimshurst Electric Machine.

We illustrate the new Wimshurst Influence Machine, which is controlled by the E. S. Greeley and Company of this city. This little article must prove a great boon to college students, experimenters and others studiously inclined in an electrical direction; and as an educational apparatus for boys and girls it will meet with much popularity, as it is cheap, harmless and instructive. It goes far beyond the scope of a toy, as by the use of large Leyden jars the usefulness of the apparatus in creating static discharges will place it on a par with larger machines. The apparatus which we illustrate with a small oblong plate glass Leyden jar is calculated to develop an inch spark.

—— The Schuyler Electric Company was awarded the contract for lighting the Exposition at Newbern, N. C., which opened on Feb. 19.

—— A charter has been granted to the Hagerstown Electric Company, the incorporators being Charles E. S. McKee, Thomas B. Cushwa, Jacob Rosner, George A. Davis, Alexander Neil, George W. Smith, Jr., and Charles E. Dustin. It is proposed to purchase the electric plan installed by the Schuyler Company which is doing a fine business and gives satisfaction. Hagerstown feels good over its light, and it has every reason to. The company has a five years' contract with the city, and nearly 1,000 incandescent lights are already in use and the demand is constantly increasing.

The Storage Battery Plant in Potter Palmer's Residence.

On the afternoon of Wednesday, February 20th, at the close of the daily session of the Electrical Convention, a large party of visitors and delegates inspected the electric lighting of the residence of Potter Palmer, Esq., on the Lake Shore Drive, at the invitation of the representatives of the Electrical Accumulator Company, who have recently installed a large plant for Mr. Palmer. Considerable interest was manifested on account of the novel character of this installation.

Power for this plant is supplied by an Otto gas engine capable of developing 21½ actual horse-power. The power is transmitted to a dynamo of the U. S. Company's make by means of a counter-shafting, on which is placed a heavy fly-wheel to steady the motion, which would otherwise be slightly irregular on account of the fact that the gas engine only takes gas at every second revolution.

The dynamo has a capacity of 75 amperes, and an E. M. F. of 125 volts, which may be increased slightly, if desired. This dynamo charges two series of 56 cells each, of the Electrical Accumulator's 15A type. These two series are connected in parallel, and when fully charged are capable of supplying 100 sixteen candle-power lamps for 10 hours. The dynamo is capable of supplying 120 of the same lamps, making the total normal capacity of the plant 220 lamps, which may be increased to 250 by allowing the accumulators to discharge at their maximum rate.

The switchboard is fitted with all of the latest appliances, and is so arranged that a number of combinations may be made.

1st. The dynamo may supply lamps direct.

2d. The dynamo may charge the battery and supply light at the same time.

3d. One-half of the battery may be charged while the other half is discharging.

4th The accumulators alone may be used for supplying lamps without the aid of the dynamo.

5th. The accumulators and the dynamo together may be called into service to operate in conjunction, when the maximum number of lamps is desired. The accumulators are provided with means for equalizing the charge and discharge; for preventing injury to the cells by overloading, and to prevent the cells from discharging into the dynamo, if its electro-motive force should fall below that of the battery.

The plant is located in the stable, and current is conveyed to the residence nearly 200 feet distance, by means of Patterson underground cable laid in a substantial wooden box, which is filled with a mixture of pitch and sand. This same conduit brings back a pair of pressure wires from the house, which are connected to a potential indicator in the dynamo room, in order that the attendant may regulate the candle-power of the lamps without difficulty.

It is believed that this is the first plant in this country in which so large a gas engine has been used for incandescent lighting in connection with accumulators. The plant, so far, is giving perfect satisfaction, and from the fact that power and current are available at all times, it is expected that the plant will prove a model for private house installation.

The Ostrander Door Opener.

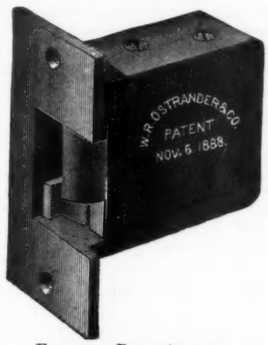
The above illustration shows the electric door opener which has been put upon the market by W. R. Ostrander & Co., of New York, and which has already met with much success. The apparatus is positive in motion, and the movement is one of gravity and devoid of delicate springs or mechanism. The button may be placed at any distance, and by simple pressure on it the catch is relieved and the door opened. The construction of the parts has been carefully looked after, and tests have shown the device to be practical in every day working.

—— The City Engineer has ordered the Toledo Electric Company to put up a number of new lights ordered by the council, but the company is having trouble to get wire fast enough. It has ordered 14 miles.

East St. Louis, Ill.—The Sweanor Liquid Gold and Silver Concentrating Company, of East St. Louis; capital, $6,000,000; Messrs. George Sweanor, Henry J. Anderson and James N. Morgan, incorporators.

Nashville, Tenn.—The City Electric Railway Company; to build an electrical street railroad; capital stock, $40,000; Isaac T. Rhea is president; James H. Bruce, vice-president; Sanford Duncan, secretary; and R. W. Turnear, treasurer.

Philadelphia, Pa.—The Mutual Steam Heat Company, of Philadelphia, with a capital of $1,000,000. The directors are Henry Clay, James McManes, David H. Lane, J. P. Bower, Jr., and Frederick W. Roebling, all of Philadelphia.



ELECTRIC DOOR OPENER.

Chicago, Ill.—The American Construction Company, capital $1,000,000, is formed to construct, equip, and operate street, steam, and elevated railroads, and manufacturing plants. James M. Gamble, Paul E. Lowe, A. J. Cooper, Charles P. Newberry, and Judd G. Sherman.

Benton Harbor, Mich.—The Benton Harbor & St. Joseph Electric Light Company has been organized by I. W. Conkey and J. B. Morrison, of Benton Harbor; W. Ballengee and R. S. Collins, of St. Joseph; and W. W. Bean and W. G. Keith, of Cincinnati, O. Capital stock, $25,000. The plant will be located between the two towns, and arc and incandescent lights furnished.

THE WIMSHURST INFLUENCE MACHINE.

Olympia, W. T.—The Olympia and Tumwater Railway, Light and Power Company, its purpose being to purchase, construct, equip and operate street railways, electric motor power and lights, telephone and telegraph lines; the business will be transacted in Olympia. The incorporators are: Edward M. Wilson, A. M. Stewart, Leroy Pratt and Newman Kline, of Tacoma; and J. R. Hayden, A. A. Phillips, H. T. Mays, N. H. Owings, G. D. Shannon, G. A. Barnes and T. M. Reed, of Olympia.

Camden, N. J.—American Pipe Manufacturing Company, with an authorized capital of $1,000,000, of which $2,000 is said to be paid in. The company proposes to manufacture patented hydraulic pipe and other pipes for use of water, gas, electric light, etc. The incorporators are: Edwin F. Partridge, Nathan B. Cox, William S. Perot, Jr., David J. Hoar, Joseph S. Keen, Jr., and Charles S. Farnum, of Philadelphia; Joseph D. Hawley, of Media; William M. Paul, Moorestown; and Clifford Stanley Sims, Mt. Holly.

Greensburg, Kas.—The Greensburg Gas and Mining Company, of Kiowa County; capital stock, $5,000. Directors, C. W. Myers, S. F. George, C. F. Mingenbock, C. Pierce, H. H. Potter, S. B. Sproule, E. O. Gregory.

Jefferson, Ill.—Jefferson Rapid Transit Railroad and Electric Lighting Company, of Jefferson; capital, $250,000; for horse and dummy railroads and electric lighting; incorporators, G. H. Parker, G. C. Thomas, S. S. Kimball.

Chicago, Ill.—The Chicago Architectural Iron Works, at Chicago; capital stock, $25,000; for the manufacture of iron work, electric apparatus, bells, and speaking tubes; incorporators, M. Salomon, H. H. Meiselbar and E. J. Walsh.

Taylorville, Ill.—Taylorville Electric Light and Power Company, at Taylorville; capital stock, $20,000; to furnish electric light; incorporators, W. W. Anderson, J. Bourne, R. H. Browne, J. G. Drennan and W. H. Kirkwood.

Carlinville, Ill.—The Carlinville Water Company, of Carlinville; capital, $75,000; to provide and furnish water, light, power and heat within and near the city of Carlinville. Incorporators, F. Wm. Raeder, W. G. Reeve and George Siegel.

Covington, Ky.—The Hughes Manufacturing Company. The incorporators are Edw. F. Sprague, H. F. Hughes and Wm. Hays. The capital stock is $50,000, and the business is the manufacture of gas and electric machines and electric plants.

Clayton, Ohio.—A company has been organized, with an authorized capital of $15,000, for the purpose of lighting Clayton with electricity. The plant is to include 40 street lights. The officers are as follows: D. Wilson Moore, president; George H. Hewitt, secretary, and T. M. Pierce, treasurer.

Bridgeport, Conn.—The Nevada Copper Company, of Bridgeport; capital stock, $100,000, 1,000 shares of $100 each; Franklin Farrel, Mary W. Farrel, Mrs. Lillian C. Farrel (all of Ansonia); A. F. Migeon, Torrington; H. L. Bancroft, Bridgeport; E. H. Tomlinson, Thomas Wallace, Jr., Ansonia; J. H. Mathews, Jr., Bridgeport.

Tacoma, W. T.—The Northwest Electric Power Company, for generating electricity for light and power and furnishing it to individuals or corporations; the capital is a quarter of a million. The trustees are: Allen C. Mason, R. F. Radebaugh, Thomas B. Wallace, Isaac W. Anderson and Hugh C. Wallace.

Kansas City, Mo.—The Great Western Steel Rolling Mill and Steel Wire Company; capital, $200,000; to erect a factory at Rudolph, near Kansas City. Edward A. Beers, of Springfield, Mo., is president. The company will manufacture merchant iron, iron nails, steel wire, iron and steel rods, and barb wire.

Newark, N. J.—The New Jersey Phonograph Company. The incorporators are Garret A. Hobart, Nicholas Murray Butler, Edward T. Bell and William T. Ryle, of Paterson, and Anthony Q. Keasbey, Howard W. Hayes, Edward A. Day, Frederick Frelinghuysen, Sylvester S. Battin and Elias A. Wilkinson, of Newark.

San Diego, Cal.—San Diego and Eastern Terminal Railroad Company; stock, $500,000; subscribed, $200,000; W. A. Carlson, Thomas Higgins, F. Dixon, H. G. Christiansen, J. P. Burt. The purpose of the company is to establish water plants, electric light plants, and to assist in the construction of telegraph and telephone lines.

St. Louis, Mo.—The St. Louis Subway Company; capital, $50,000, all paid up. There are 50,000 shares of stock of $10 each held by the following parties: Chas. Sutter, 49,800 shares; M. F. Taylor, 125; and D. J. Harris, W. L. Hull and D. H. Dorsett, 25 each. The object of the Association is to lay the Dorsett conduit system for electric wires.

Denver, Col.—The Montrose Electric Light Company, of Denver, has filed articles of incorporation.

Cincinnati, O.—The Lunkheimer Brass Manufacturing Company, of Cincinnati; capital stock, $250,000.

Milwaukee, Wis.—The Western Electric Light Company, of Milwaukee, capital stock $100,000, has been incorporated.

Camden, Me.—The Camden and Rockport Electric Light Company has been incorporated with a capital stock of $12,000.

Boston, Mass.—The Wright Electrical Engineering Company has been organized at Boston; Alex. P. Wright is president.

Leavenworth, Kas.—The Leavenworth Electric Light Company, of Leavenworth, capital stock $100,000, has been incorporated.

New Ulm, Minn.—The New Ulm Electric Light Company, of New Ulm; capital stock, $25,000; Mr. Mullen and others, incorporators.

Montrose, Cal.—The Montrose Electric Light Company; capital stock, $10,000; F. W. Hamlin, A. Heibler, and C. G. McConnel, incorporators.

Piedmont, Md.—The Peidmont Electric Light and Power Company of Piedmont; capital stock, $20,000; G. M. Harrison, H. G. Buxton and others, incorporators.

Baker City, Ore.—Baker County Telegraph and Telephone Company, of Baker City; stock, $30,000; H. C. Bowers, J. Manandas, H. S. Bowen, incorporators.

Nashville, Tenn.—The Capital Electric Company, of Nashville. The incorporators are W. L. Danley, J. H. Ambrose, Adolf Dahlgreen, W. H. Smith, and T. A. Atchison.

Seattle, W. T.—Merchants' Electric Light Company, of Seattle; stock, $50,000; Jno. D. Lowman, Geo. B. Adair, Z. Z. Miles, W. P. Boyd, A. Burwell, G. H. Heilbron, J. B. Macdougall, incorporators.

Kirkwood, Mo.—The Kirkwood Electric Light and Power Company has been organized, with C. A. Kitchen at its head. There will be 500 incandescent lights of 16 candle power; capital stock, $5,000.

Chicago, Ill.—Adams Express Building Company, Chicago; capital, $600,000; to furnish stores, offices, heat, light and power; incorporators, John B. Carson, Andrew J. Cooper and Noble D. Judah.

Pitsburgh, Pa.—The Electro-Hydraulic Company, of Pitsburgh, with a capital of $10,000. The incorporators are J. P. Whiterow, R. F. McFeely, H. S. Floyd, M. E. Herron and J. F. Edmundson.

Portland, Me.—The new Commercial Union Telegraph Company has been organized by the choice of H. S. Osgood, president; S. L. Larrabee, secretary; and Albion Little, treasurer, all of Portland.

Chicago, Ill.—The Millard Avenue Electric Company, of Chicago; capital, $25,000; to furnish heat, light and power, and deal in apparatus, supplies and machinery. Incorporators, George Martin, M. Willard and A. A. Bliss.

Poughkeepsie, N. Y.—A certificate of incorporation of the New York Phonograph Company has been filed here. The capital stock is fixed at $1,250,000, divided into 12,500 shares. The trustees for the first year are: John P. Haines, of Toms River, N. J.; John D. Cheever, Richard Twomley Haines, Noah Davis, William Fahnestock, W. Seward Webb and John L. Martin, of New York City.

ELECTRICAL REVIEW

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In the city of New York the telephone company has over 6,000 miles of wire underground, comprised in 53 miles of cable.

Mayor Grant should not expect impossibilities. Does he really believe he can put all the electric wires of New York into conduits in 30 days?

That necessity is the mother of invention needs no proof, and is illustrated daily. The natural gas and crude oil regions of Ohio and Pennsylvania have created new wants which are being met by the active minds of that part of the country, and electricity is entering largely into the devices for the management and control of these new heating agents.

The people of Indiana after four years trial of a law restricting telephone rates, pronounce it a failure and the law is repealed. Will other States profit by the experience in Indiana? We hope so.

The Germans make use of a very convenient little word as the call on the multiple telephone divisions used at central offices. It is "Fernsprechvielfachklappenschrauke!" This word has evidently been invented with the view of expediting the service.

The magnitude of the electric arc lighting industry can perhaps best be realized by a glance at the output of the various carbon companies throughout the country. The city of Cleveland alone turns out millions of these little illuminating rods each month.

Toledo, Ohio, has been having a heated controversy over the introduction of an electric street railway. With its clear, pure atmosphere, shaded and almost perfectly level streets, it would seem that Toledo needs but an electric railway to complete its happiness. Then, too, the fact that Detroit has such a road must be an incentive.

The ELECTRICAL REVIEW is complete and comprehensive this week, as it always is. We think all our readers—and their swelling numbers is most gratifying—will be more than satisfied. The energetic advertiser is also with us, yet his interesting and important matter is not permitted to encroach upon reading matter. Please observe this fact.

The many and diverse problems brought before an electric light or power manufacturing company, require both minds and machinery capable of widely differing conceptions and uses. The Brush Electric Company was recently called upon to devise some sort of a governing apparatus for a mammoth water wheel in the West. Although hardly in the usual line the Brush people solved the problem and now successfully govern the wheel.

No more conclusive proof of the interest electricity and electrical apparatus awaken in the minds of the people could be shown than the great attendance at the recent Chicago exhibition. And, perhaps, a potent factor is the mystery which enshrouds this form of energy. Everything from an inoffensive leather belt to a wooden lunch counter left over from some previous assemblage, was looked at with suspicion, as though the beholder half expected an electric current to issue therefrom and join in the miraculous performances going on upon all sides.

THE INDIANA TELEPHONE LAWS REPEALED.

The Indiana legislature has repealed the bill establishing telephone rates. The bill was passed two years ago and provided for a charge of $3 per month for each telephone, and that where two or more telephones were in use by the same person the rate should not be more than $2.50 per month each. As a result of the law, the exchange in Indianapolis became nearly bankrupt and gave very poor service, while nearly all the telephones in southern Indiana were taken out. The telephones in Indiana are operated by the Central Union Telephone Company of Chicago, and the Ohio Valley Telephone Company of Louisville. The telephones that were left in place were those upon which the subscribers volunteered to pay toll rates.

This was a most unjust law, and the legislature of Indiana has finally shown good sense in repealing it. This action cannot fail to have an important bearing upon the question of telephone legislation, and should be influential in calling a halt on the injudicious, and often the malicious, rate legislation now proposed in many of the State legislatures.

THE CHICAGO CONVENTION.

A FEW COMMENTS FROM AN EDITOR'S STANDPOINT.

The last Convention was unique in several respects.

Although held in a Western city, the entire attendance, with the exception of a possible half dozen, was from the East of Chicago and Chicago proper. The prediction that the holding of the Convention in Chicago would secure an increase both in membership and in attendance from the West proved an utter fallacy. No explanation of this is given, but the fact remains as stated.

The first conspicuous incident of the Convention occurred on Wednesday, when in discussing the underground question the central station men became impatient, and fire flew all along the line. The scene was an interesting one. Mr. Eugene T. Lynch, Jr., chairman, had given his report on underground conduits and conductors, and an unprejudiced listener could hardly have reached a conclusion other than that the question of the burial of electric light wires was now so small a matter, owing to failures of trials in the past, as to merit no further notice in the Convention. This naturally stirred up several of the advocates of underground wires, notably, W. H. Johnstone, of New York, John P. Barrett, of Chicago, J. B. Ecclesine and others. President Duncan counseled moderation. Ex-President Morrison asked that the speakers tell their stories in their own language, which they proceeded to do. The question came up on continuing the committee, and adding to it Messrs. Barrett, Sunny and Sperry. This was a proper thing for the Convention to do, but in the excitement of the moment members of the Association engaged in operating electric light plants imagined that it meant a great deal more, and presented amendment after amendment, substitute after substitute, all of which were voted down by a majority of from four to a dozen votes, with one or two exceptions the central station men voting solidly on one side and the gentlemen representing manufacturing companies and allied interests on the other. Then an adjournment was had until the next day, and before the evening passed the central station men realized that they had been over-sensitive and had placed themselves in a wrong position, from which they extricated themselves the next day by voting unanimously for that which they had so earnestly opposed the day before.

This brings up the question of what constitutes the dominating element in the National Electric Light Association, and as this journal had the honor of editorially calling the Convention into existence, it may not be amiss at this point to publish that call as it appeared, in double-leaded type, upon the editorial page of the ELECTRICAL REVIEW in its issue of January 17th, 1885. It was as follows:

"*THE ELECTRIC LIGHT CONVENTION.*

"We are requested by the representatives of a large number of electric light companies, to publish the following:

"A Convention of delegates who represent companies doing an electric light business in the United States and Canada will be held at the Grand Pacific Hotel, Chicago, on Wednesday, February 25th, 1885. Every electric lighting company in the United States and Canada is invited to send delegates. Properly accredited delegates will find headquarters established at the Grand Pacific Hotel on their arrival."

It will be noticed from the above that the call was issued for the operators of electric light companies, now more clearly defined as central station men. The REVIEW has always believed and contended that the control of the Association should be vested in the gentlemen engaged in furnishing and supplying electric light, and that carries with it naturally electric power.

The division at Chicago, on the lines above stated, showed the risk to the Association in so diversifying the control as to make obscure the real mission of the Association.

As to the decision, there is no doubt that the members of the Association voted as they believed, and taking the membership of the National Electric Light Association as it stands to-day, the majority believe that the burial of high tension electric wires is a problem that is being gradually worked out, the chief objection being the expense, or as Mr. T. Carpenter Smith puts it, "a question of insulation, and (holding aloft his pocket book), here is the insulation."

We think the central station men a little too sensitive on this point. It is a question they must consider, and we are sure when they think of it (for as a rule they are broad-gauged men), they will decide that the best way to treat it is to meet the question in a manly straightforward manner, and give the advocates of underground wires every reasonable opportunity to prove their position. This does not mean the wholesale burial of electric wires, particularly in those localities where it would mean ruin to the company, and we are sure the public and the advocates of underground wires do not expect this. The public as a whole are now very good judges of what is going on in electrical circles, and are not to be satisfied by any such action as that would have been, had the National Electric Light Association failed to recognize the importance of this question.

No greater evidence of the push and energy of the gentlemen engaged in electrical pursuits has ever appeared than was shown in the very comprehensive exhibit. We have described it in detail, and mention it here for the purpose of emphasizing the energy and enterprise of those who presented this magnificent display, at great expense, to an audience that lasted for only three days. No other industry could or would have done this, and no other industry could have presented a collection so unique, interesting and valuable. It is such occasions as these that the importance of having the interests allied to the operating companies in most friendly relations with them, is made particularly evident.

It has always been an unfortunate feature, but was most conspicuously so at the Chicago Convention, that important papers, which should have received careful study and discussion, are bunched in the closing hours of the Convention. We would respectfully suggest to the present executive committee the advisability of arbitrarily placing certain papers, with an allowance of time for discussion, upon the programme for each day.

The report of the executive committee was the most satisfactory ever made to the Association, and was received with applause.

The administration is certainly to be congratulated on several features, notably, the increase of membership, the increase of interest, and the increase of treasury funds. The active co-operation of every official of the Association during the next year will undoubtedly continue and advance the work done in this respect, and the REVIEW hopes to see the Association strongly established, with permanent headquarters, where its growing business can be transacted in a methodical and intelligent manner. This does not mean that the Association should meet always in one city, for it certainly appears to be an advantage to hold conventions in the different cities of this great country of ours.

The election of officers, which occurred Thursday morning, was the happy outcome of some pretty lively work. Although they were numerically the weaker, preference was given to the views of the central station men, and harmony was the watch cry.

BOOK REVIEW.

Electro-Chemistry. — A Theoretical and Practical Treatise, by DONATO TOMMASI.

Chemists, electricians, inventors and many manufacturers will find in this comprehensive work many valuable bits of information, some already known but excellently collated, others now for the first time intelligently set forth. The whole ground of electro-chemistry is very thoroughly gone over and the various industrial applications described. The work abounds in tables of great usefulness, and will undoubtedly take a high rank among the works of reference on the subjects which are treated. The book comes from the press of the well-known publishing house of E. Bernard & Cie, Paris, and is, of course, in the French tongue. Parts I and II are now ready, and the remaining parts are in press and will shortly issue.

THE NEWS.

What is Transpiring in Electrical Circles, as Gathered by our Alert Correspondents.

OUR BOSTON LETTER.

Club Meeting.—The regular monthly meeting of the Electric Club will be held at the new club rooms, No. 7 Park street, this evening at eight o'clock. Many questions of the utmost importance and liable to affect the entire future policy of the club are to be discussed.

Reception by the Welding Co.—The Thomson Electric Welding Company, through Mr. H. A. Royce, general manager, have issued invitations to members of the press to be present at a reception to be given by the company at the station of the Malden Electric Company, at Malden, this evening. A large variety of welding will be shown and the value of the Thomson electric welding process to the various metal industries will be fully illustrated.

Returning from Chicago.—The New England delegates to the Chicago Convention have been returning by twos and threes during the past week. Several improved the good start made and continued on into the Western country. Among these were Mr. Louis W. Burnham, of the Electric Gas Lighting Company, and Mr. M. J. Francisco, the progressive electric light man, of Rutland, Vt.

Dinner and Lecture.—The second Electric Club dinner of the year will be given at Young's on Wednesday evening at 7.45. Dr. Moses Greeley Parker, of Lowell, will address the Club after dinner on "Peculiar Rotary Motions Found in Lighting and Other Electrical Currents." The paper will be based on the lectures recently given at the New York Electric Club and before the Society of Arts of this city, but much new data and many new and interesting illustrations have been added. Mr. John C. Wilson and Mr. Otis K. Stuart have charge of the arrangements.

Thomson-Houston Stock.—From the Boston *Advertiser:* "Sales of Thomson-Houston stock are reported at 200. This stock has a par value of $25. About a year ago, if I am not mistaken, it was selling at 52 to 55 ex-rights. It afterwards jumped to 85 and hung there for a while, from which price it advanced to above 100. At this point it gave a sudden jump and went to the neighborhood of 135 in a very few sales. Afterwards it sagged a little, and then advanced to about 150. February 8 the stock was traded in at 146, and since that time has occurred an advance to the highest point yet reached."

Electric Hearings.—Much interest is taken in the hearings now being held before the legislative street railway committee on the subject of the dangers incident to the use of overhead wires on electric railways. With such an authority as Professor Thomson, of the Thomson-Houston and Thomson Electric Welding Companies, giving testimony, many valuable facts are brought to light. Among others testifying last week were Mr. William McQuesten, who put in the West End Company's electric plant, and Mr. C. J. H. Woodbury, of the Manufacturers' Mutual Fire Insurance Company.

Electric Roads in Lowell.—Mr. W. A. Bowland appeared last week before the Lowell street railway directors to demonstrate to them the feasibility and economy of the use of electricity as a street railway motive power. He gave full details of the workings of an electric railway. The Lowell council has appointed a committee to investigate the desirability of the city running its own electric light plant.

A Plant Sold.—The Concord, N. H., Gas Light Company has bought the plant of the local electric light company, which consists of three dynamos and 126 arc lights, and takes possession April 1. An incandescent plant will be installed in connection with the present arc plant as soon as the necessary arrangements can be made.

Personal.—Mr. Lewis I. Fletcher, for the past two years the efficient manager of the Nashua electric light plant, has resigned to accept the management of the Middlesex electric light station at Lowell. Mr. Fletcher is an energetic young man, who will be missed by many friends in Nashua.

Large Orders for Mather Lights.—The Mather Electric Company has recently received many orders, including plants for the *Pioneer Press*, St. Paul; the Aberdeen flats, St. Paul; the Governor Evans buildings, Denver; two large Fall River plants and a California hotel, the latter a $20,000 contract for 2,640 lights, three engines and four 400 arc light dynamos. T. W. S.

Boston, March 4th, 1889.

OUR WASHINGTON LETTER.

Another Electric Car.—The president and superintendent of the River and Rail Electric Light Company, of New York, with Prof. William Main, the inventor of the system which the company is exploiting, have been in this city for several days with an experimental street car propelled by Main's motor and storage battery. It is a handsome 16-foot car, carrying 56 accumulators, weighing 2,500 pounds. The seven horse-power motor and other machinery weigh about 1,000 pounds. It is claimed that 25 miles' run can be made from one charging of the accumulators. One or two trips have been made on the Pennsylvania avenue road, between the Capitol grounds and the Treasury Department, but the car failed to get up the four per cent. grade on Fifteenth street without assistance. It is to be shipped to Boston to-morrow for exhibition on some roads in that city.

Increasing the Plant.—Mr. Stebbins, of the Thomson-Houston Company, is superintending the installation of the additional plant of the Soldiers' Home road, which includes one 80 horse-power dynamo, one 100 horse-power Armington & Sims engine, with increased boiler power, etc. The company is expecting four additional motor cars and seven double-deck tow cars, of special design, which will be here next week. The new motor cars will be an improvement on the first, having, among other advantages, bay window ends which protect the engineer from bad weather, and give his platform a strong resemblance to the pilot house of a first-class steamboat. These additions to the road will quadruple its carrying capacity, and, like everything else in Washington, are to be finished in time for the inauguration.

Telephone Exhibits.—Wm. D. Sargent, of Brooklyn, has been spending some time here this week, in consultation with Prof. Bell and Gardiner G. Hubbard, regarding the telephone exhibit at the Paris Exposition, which he is making plans for and will have charge of. The exhibit will include a large collection of Prof. Bell's important inventions, showing the development of the telephone from the first instruments, which now appear so crude and unfinished, but which are still good, practical, talking telephones, to the latest and most perfect long-distance instruments. Mr. Sargent expects to sail on the 13th of April direct to Havre, and will be absent about six months.

Congressional Sanction.—It required a special act of Congress to authorize the running of a few short sections of telegraph wire to reach the temporary offices of the inaugural procession managers, and this act stipulates that the wires shall be taken down within a week after the inauguration.

A Senatorial Opinion.—Senator Sherman has announced another valuable bit of information, that "electric wires underground are safe and of no danger to human life."

G. C. M.

Washington, March 1, 1889.

OUR CALIFORNIA LETTER.

Candle Power.—Eastern electricians who wish to determine the candle power of an arc lamp need to go to Los Angeles for points, for one of the city fathers stated at a recent meeting of the council that he knew an instrument that could be placed on the sidewalk under an electric lamp and the candle power of the light read off directly. He has not produced this instrument yet, however. The city council is now wrestling with the electric lighting problem, both in its practical and scientific questions, and is rapidly solving the problems which turn gray the hair of the station superintendent. One of the councilmen, finding there was a loss due to the resistance of the wire, which could be decreased by an increase in its size, moved that the electric lighting company be ordered to substitute No. 0000 wire for the No. 4 they are using. The company think the suggestion good, but a trifle expensive. Another councilman indignantly protested, because the engine was indicated only twice a month, and insisted that the indicator should be on the engine all the time, so as to have a continuous record.

The Electric Development Company.—This company closed a contract this week for lighting the American Sugar Refinery in this city. They will put in an Edison plant of 375 lights and a No. 10 standard dynamo. Habirshaw wire will be used throughout, and the whole plant will be put in in the best manner. Work has just been completed on a 95-light plant on the excursion steamer "Hermosa," which will run between Wilmington and Santa Catalina Island, and the lights give great satisfaction.

Personal.—Recent Los Angeles visitors were Messrs. McNitt, of the Thomson-Houston Company, Lloyd, of the Brush Company, Goode, of the Westinghouse, and W. C. Clark, of the Waterhouse Company. The latter went down to look after the plant he is putting into the new Southern Pacific depot.

A New Light Company.—J. D. Lowman, Geo. B. Adair, Z. Z. Miles, W. P. Boyd, A. Burwell, G. H. Heilbron and J. B. Macdougal are the incorporators of the Merchants' Electric Light Company, of Seattle, W. T., capital stock, $50,000.

Electric Lighting.—The Rhodes & Keese Electric Company have just been awarded an important contract for lighting the new City Hall at Los Angeles. They will put in an 800 light Thomson Houston incandescent system. They use Okonite and P. & B. wire in all their lighting work. They have just arranged in their office for exhibition a complete Gamewell fire alarm system, for which they are agents.

Electrical Society.—The first regular meeting of the California Electrical Society will occur next Monday evening, when, in addition to the regular business, a paper will be read by Mr. John C. Henry, of Kansas City, on "Electric Railways."

Increasing Business.—D. P. Smith, the Honolulu agent of the Thomson-Houston Company, is in the city on his way back to the Sandwich Islands. He takes back with him two 30 light arc dynamos and outfits, and two 1,000 light alternating plants, which he has purchased for the Hawaiian government.

Electricity Afloat.—The new river boat, "J. D. Peters," began making regular trips between this city and Stockton on Monday. She is a stern-wheeler of the latest type, and has all modern conveniences, including running water in her staterooms, and is lighted throughout by electricity. The plant consists of 175 Thomson-Houston incandescents and dynamo, driven by a twenty-five horse Straight Line engine. The steamer's bow, side and masthead lights are all electri , and the side lights are fitted with an alarm arrangement which starts a light in the pilot house if either of the side lights becomes extinguished in any way.

New Motor Circuit.—Mr. Jos. L. Payne, the representative of the Sprague Motor Company for California and Nevada, has recently been in San Diego and Los Angeles. He expects to put in a motor circuit at the latter place in a short time.

A Brush plant has been started at Vancouver, W. T. E. G. T.

San Francisco, Feb. 24, 1889.

OUR LETTER FROM THE SOUTH.

Falling Into Line.—Salsbury, N. C., is contemplating a proposition to issue bonds to the amount of $100,000, to improve the town by putting in an electric light plant.

President Elected.—Mr. Thomas Jeffers has been elected president of the Merchants' Electric Light and Power Company, recently reported. They will soon commence work on the plant.

New Plant Proposed.—It is proposed to erect an electric light plant at Marietta, Ga.

A Kentucky Contract.—The Frankfort, Ky., Gas Company will erect an electric light plant, and have contracted for machinery of 100 horse-power capacity, and fifty 2,000 candle-power lights.

A Storage Plant.—The Electrical Accumulator Lighting and Power Company, of St. Louis, Mo., have contracted to light the town of Dyersburg, Tenn., and will erect a plant.

Electric Railway.—A company has been formed at Knoxville, Tenn., to build an electrical railroad to Lyon's View. They will soon commence work, as right of way is being secured.

A Texan Enterprise.—A $35,000 stock company has been formed at Victoria, Texas, to erect an electric light plant.

E. A. O.

Charleston, S. C., March 1, 1889.

A very Strong and Business-like Organization.

The vast electric light interests of which Mr. George Westinghouse, Jr., is the energetic head, have been, we are informed, undergoing several changes consequent upon the consolidation of so many companies. The organization has three grand divisions, of which Mr. Westinghouse, of course, will be the general in command.

Mr. George W. Hebard will be at the head of the United States Electric Lighting Company, which will have charge of the business of manufacturing for isolated plants.

Mr. H. M. Byllesby will be at the head of the Westinghouse Electric Company, which includes all central station and power work.

Mr. P. H. Alexander will be at the head of the Sawyer-Man Electric Company, which includes the entire management of the manufacture of incandescent lamps.

The incandescent lamp factory in New York will continue, as well as the extensive factories of the United States Electric Lighting Company of Newark, and the Westinghouse Electric Company in Pittsburgh. The general offices will be at the Equitable Building, 120 Broadway, New York.

The territory will be divided up among a few able and energetic gentlemen, titled general agents, who will be individually responsible for the business in their different territories.

PERSONAL.

Charles E. Dustin, vice-president of the Schuyler Electric Company, who has been seriously ill for several months, is once more at his post ready for business.

Mr. E. A. Leslie, so well known in telegraphic and other electrical circles, has accepted the position of general manager of the Manhattan Electric Company of this city, with headquarters at 511 Broadway. The Manhattan Company is to be congratulated on securing the services of a gentleman of the executive ability and activity of Mr. Leslie.

Mr. W. H. Sawyer, secretary of the American Electrical Works, Providence, paid New York one of his rare visits last week, and met many old-time friends.

President E. R. Weeks, of the National Electric Light Association, visited New York and Boston after the adjournment of the Chicago Convention, and was congratulated on his deserved election by numerous friends in both cities.

Mr. Henry Hine, who for years past has had charge of the general sales department of the United States Electric Lighting Company, has been appointed and accepted the position of general agent of the consolidated Westinghouse interests for the Middle States, which include the valuable territory of New York, Pennsylvania, New Jersey, Maryland and Delaware. This is a territory in which the demand for electric lighting is constantly increasing, and, although the competition is very lively, we are certain that Mr. Hine will make a splendid showing. He is one of the few thoroughly competent electrical engineers who is also a practical business man, and the REVIEW, in addition to congratulating him upon this deserved recognition of his talents and ability, congratulates Mr. Westinghouse upon the choice he has made.

MANUFACTURING NOTES.

The Pond Engineering Company, of St. Louis, Mo., has just issued a very handsome publication. It comprises illustrations of engines and boilers, steam pumps, etc., handled by this company, as well as a number of very complimentary testimonials of owners of electric light plants, and others who have been fitted up by the Pond Company. The front page of the catalogue is a work of art, illustrating electric lights, both arc and incandescent, electric power, and presenting a view of an electric light station. This new catalogue will be sent upon application and will be welcomed wherever received.

W. R. Ostrander & Company, 21 to 25 Ann street, New York, with factory in Brooklyn, has recently issued a catalogue of some 90 pages, covering a very extensive list of electrical appliances manufactured by this company. The catalogue is abundantly illustrated, and contains complete price list.

The Ball Engine Company, Erie, Pa., have been very successful in the manufacture of their automatic cut-off engines, and the sales of the past year have been very flattering, compelling the works of the company to run night and day most of that time. The demand for their engines is increasing, especially for electric lighting for electric street railways, and a number of engines have been sold lately to manufactories who are operating their own electric light. This engine is decidedly popular with electric light users. A new catalogue can be obtained on request.

The Kansas Electric Company, of Topeka, Kans., of which Mr. R. B. Gemmell is president, Mr. Geo. J. Bayless, general superintendent, and Mr. S. J. Bear, secretary and treasurer, is succeeding handsomely in handling the general electrical business in the State of Kansas, besides dealing in electrical supplies. They do a general electric wiring business, and are agents for a number of well-known manufacturing companies. They have recently taken up incandescent light wiring, and under the competent supervision of Supt. Bayless are making a most excellent record.

The Gilliland Electric Company have purchased 80 acres of land near North Morenci, Michigan, for the purpose of furnishing the factory with a supply of material for a short time. The company recently shipped an extra fine order of mimeograph boxes to Chicago. They were made out of the prettiest mahogany burl that could be purchased, and they are to be re-shipped from Chicago to Paris for display at the coming exhibition.

An Important Question.

PAPERS READ BEFORE THE NATIONAL ELECTRIC LIGHT ASSOCIATION, IN RELATION TO MUNICIPAL OWNERSHIP OF ELECTRIC LIGHT STATIONS.

"MUNICIPAL OWNERSHIP OF COMMERCIAL MONOPOLIES," BY A. R. FOOTE.

Since the day when Hermes Mercurius Trismegistus went up into the Mount of Regeneration, with his son Tat——, to recite his secret sermon, it has been clear to all thinking minds that, by the use of terms, the people are deceived.

This subject should not be called "Municipal Ownership of Natural Monopolies." Its true name, designating accurately the economic principle which it advocates, is Municipal Slavery—a scheme to enslave capital and pauperize the people.

The economic principle advocated is not in accord with natural economic law; therefore, it is an obstruction to the progress of civilization.

You who are here assembled know that all progress is due, and must ever be due, to the discoveries of science being made available for the uses of man. There is but one science—the science of natural law. The nearer its devotees or investigators arrive to an understanding of natural law, the nearer they apprehend the truth. Actions guided by truth are the guarantors of benefactions.

You who have experimented, with great patience and at great cost, to discover the natural laws governing the generation and control of electric energy, know how impotent all your devices are to compel that energy to serve you, if they fail to comply with the conditions of those laws. The same fact is true in economic science. If economic policies do not correctly apprehend and comply with natural economic laws, then the effort made is impotent to secure the best economic results.

Public ownership of commercial monopolies is advocated upon the supposition that, if worked without a profit, the economic result will be a benefit to the people. Work without profit is slavery. That slavery is not an economic benefit is proven by the experience of all men in all ages.

A man is foolish who expends time and money in an attempt to invent a thing that he can find ready made. A community is foolish to undertake an economic policy that all the data of the human race prove to be wrong; a policy which, in the very nature of things, must be absolutely wrong.

That capital is entitled to a profit for its use and risk is the foundation law of all economic science. There is not a recorded instance in the history of finance where an interference with the operation of this law has secured a permanent benefit for the people. All evidence shows that, where this law is allowed to operate with the greatest certainty, there capital is most abundant, works on the smallest margin, and produces the most healthful progress.

Capital is the conserved energy of individual action; it never loses its individual character.

When the attempt was made to Christianize communities by government authority, they remained barbarians. When communities attempt to become rich by operating commercial monopolies without a profit, they will be made paupers. Religion is individual rightness. Capital is individual energy, conserved for individual betterment. Civilization makes progress through individuals becoming better and richer.

A man's capital is his power to produce. Surplus is the product of energy in excess of the wants of life. Capital is the conserved energy of surplus. Surplus is an individual creation, and belongs by natural right to its creator. To abrogate the law of increase for use and risk is to destroy the only economic inducement men have to create a surplus. Deny men the ownership of their surplus, and they are forever slaves. Deny men an increase for the use and risk of their surplus, and all the forces of progress will be forever paralyzed.

The application of these generalizations to the question before us is easy.

First. There is no municipal surplus, unless it is taken from the surplus of individuals by taxation. This makes the individual poorer.

Second. Working public monopolies for a profit is securing income by indirect taxation. Indirect taxation is a tax on consumption.

Third. When public monopolies are not worked for a profit, their products are sold at a reduced price. This compels all private capital to abandon the business undertaken by public monopoly. By this process all the forces of progress for that industry are paralyzed.

Fourth. Every industry grows as long as it produces, or gives promise of producing, a profit for the use and risk of surplus invested in it. When, for any reason, the hope of profit fails, the industry dies. Expectation of profit is the life of industry. Its growth is in ratio to the per cent. of profit promised, plus the certainty of securing it. In the beginning, surplus created in some older industry is transferred to a new undertaking to give it life. If the new undertaking fails to create a profit, it loses its power to draw life from other industries and dies. It has failed to demonstrate its right to exist. For this reason, that man who so orders the conditions under which an industry must be worked as to deprive it of the power to create a profit is its murderer.

I know of no industry which has been developed to the best of which it is capable under public ownership.

This subject may be illustrated by reviewing the development of the gas lighting industry. Sixty-eight years ago, the first plant in the United States was installed in the city of Baltimore. To-day there are about 1,000 plants in operation, which have cost about $500,000,000. If this industry had been worked under conditions depriving it of the power to create a profit, could this enormous capital have been collected by taxation? If not, by what means would the cities of this country have obtained the benefits of gas lighting? This is not all. The power to create a profit, and the right to own the profit created, has proven a powerful stimulant to invention and improvement. By these processes, service has been improved and cost reduced, until the present price is but a fraction of the original charge. In 1878, the average price of gas in 290 cities was $3.15. In 1887, the average price for the same cities was $2, a decrease of 33 per cent. in nine years. The process is still going on. The decrease in 1888 was in a greater ratio than the average for the proceeding nine years.

Four gas plants are owned by municipalities—Philadelphia, Pa., Richmond, Va., Wheeling, W. Va., and Danville, Va. Not one of the inventions or improvements that have benefitted service or cheapened coal have emanated from either of these plants. Neither of the older works are in line with the improvements of to-day. Richmond is now engaged in improving its plant. When the work is finished as ordered, it will be in line with the improvements of ten years ago. One special point avoided in making changes is the reduction of the number of employés. Is there any political significance in this? Philadelphia has just contracted with private capital to furnish 3,000,000 feet of gas per day to the city gas works. Why? Because the city cannot make it for itself as its works are not supplied with the necessary improvements.

A comparison of the price of gas in six cities:

	1873.	1888.	Per cent. of decrease.
New York	2.75	1.25	54½
Philadelphia	2.30	1.50	35
Baltimore	2.75	1.00	63½
Richmond	3.00	1.50	50
Cincinnati	2.25	1.15	49
Cleveland	2.50	1.00	60

But why give data and make comparisons that have no scientific value, because all the factors influencing the result are not considered? If public ownership is not founded on correct economic principles, then the result of such ownership cannot produce the best economic results.

Let us now consider the effect of public ownership on our own industry. It is acknowledged that no city has yet undertaken to supply its citizens with a complete electric service. If the industry is to be developed by public ownership, why do not these cities commence in line with the progress that has been made? If they have not the enterprise so to commence, can there be a reasonable hope that they will ever catch up, keep up, or contribute to the forward momentum? To-day, private capital is ready to install electric central stations having proper apparatus and sufficient capacity to perform the entire electric service of a city.

This service now includes:

Arc and incandescent lamps for street lighting.

Arc and incandescent lamps for commercial lighting.

Incandescent lamps by meter measurement for domestic lighting.

Stationary motor service for all mechanical uses.

Motor power for operating street cars.

One of the largest companies manufacturing electrical apparatus has installed electric central stations in about 160 cities. The combined capacity of these stations would fall far short of performing the entire electric service for the city of Chicago, if the service in that city was developed to the best of which it is capable. Can anyone calculate the difference in cost of installation, operation and administration between one station, combining the capacity of the whole, and that of the 160 stations located in as many different cities? To-day, electricity is at its highest cost, and gas at its lowest cost. Gas has 50 years the start.

To supply a complete electric service to the cities of this country in a manner now known to be practical and best, will require the investment of over $1,000,000. Do the manufacturers of electric apparatus expect this vast sum to be raised by successive tax levies? If not, then they must secure its accumulation through private ownership, operating all electric central stations for a profit. There can be no hope that the electric industry can reach the highest degree of prosperity of which it is capable, if it is sold into slavery in its youth.

Fortunately for us, our industry is not the only one needing defense against the promulgation of communistic theories.

Those who advocate such theories are consistent enough to push them far toward their logical conclusion. It is well that they do so, for it is the most helpful service they can render those who would resist the encroachments of their economic policy. In elaborating their theory, they furnish all the proof needed to show its fallacies.

Professor Richard T. Ely, Ph.D., associate professor of political economy in the Johns Hopkins University, Md., may be recognized as chief in the school of communistic philosophy. By reading his books it is easy to see how, as he familiarized himself with the idea of public ownership, the list of so-called "Natural Monopolies" expanded, until by it he furnished a logical reason why all industries should be so owned and operated, if any one of them should.

A mere mention of the monopolies he recommends cities to buy, will give a good idea of the progress he has made in communism.

They are as follows: Gas supply, street car service, highways and streets, electric lighting, all railways, canals, bridges, lighthouses, ferries, docks, harbors, natural navigations, postal service, telegraphs, telephones, abattoirs, or slaughter-houses, markets, union depots, express business.

This list illogically associates non-commercial with commercial undertaking. In it are embraced a large percentage of the industries of the country. If it is so desirable for the public to own so many, why specify? Why not own all the industries?

It would be interesting to know what additions would be made to public investment, public income, public patronage, and to the number of public employés, if the recommendation of this economist were acted upon, and this entire list of undertakings were at once transferred to public ownership.

Could the party then in power ever be voted out?

This list is serviceable in another way: It shows the interests that should unite with us in combatting communism.

In his address before the Boston Merchants Association, at its annual banquet, January 8, 1889, Professor Ely said:

"I say, then, that cities should pursue a policy looking to the ultimate ownership and management of all local monopolies. * * * This is most intimately connected with local taxation. One or two methods may be pursued.

"First—These monopolies may be worked for a profit, and by profit taxes may be reduced; or,

"Second—Charges may be reduced and increased general prosperity will furnish a more plentiful source of taxes, and thus allow a reduction of the rate."

Profits on the products of public monopolies is taxation on consumption. Taxation on consumption is indirect taxation.

Since Professor Ely recommends that gas lighting, electric lighting, street car service, and numerous other industries be owned by the public, and then operated for a profit to reduce taxation, it will be well to learn his views on indirect taxation: Here they are:

"Indirect taxes violate the principles of equity, * * * we import salt and tax it 50 per cent. of its value. Does the rich man consume more salt than the poor man? * * We have in a tax like this, what is called a regressive tax, a tax which increases as income decreases—*the worst kind of a tax, and the most unjust.* * * * Indirect taxation does not discriminate between the last dollar of the poor widow and the dollar which is only one in an income of a million. It raises prices, reduces the value of income, and forces some who are already near the awful line of pauperism to cross it, and thus puts to death higher aspirations in a class of citizens, and lowers the level of civilization. * * * Indirect taxes are imposed upon people without creating so much discontent as direct taxes, and without occasioning so close a scrutiny of the methods in which the proceeds of taxation are expended, because the mass of men do not realize that they pay taxes every time they purchase dry goods or groceries. Indirect taxes are an underhanded kind of taxation. It is not, then, surprising that they are, in the minds of many, identified with despotism and aristocracy, while there is a growing opposition to them on the part of enlightened democracy."

It is not surprising, however, that an economist who sees the character of indirect taxation so clearly, should recommend those who are so oppressed to extend the list of oppressors from dry goods and groceries to gas lighting, electric lighting, car fares, and a long list of other things? Are the rich so poor that it is necessary for one penny out of every car fare paid by "the poor widow" should go to help reduce their taxes, or are they mean enough to want it done?

Suppose that all these industries were owned by the public, and the profits on them were sufficient to pay *all* the taxes, would not the payment of the tax be in inverse ratio to the income of those who pay it? Can any form of tax be more inequitable, more unjust? The short of the first proposal is, then, to tax the poor and relieve the rich. Who wants it done?

That which has been said about the slavery of capital is a sufficient answer to the second proposal.

He who assumes to be a scientist and a teacher, should be accurate. Professor Ely is reported to have said, without explanation, in his Boston address:

"Gas can be made and sold at a profit for 37 cents. I say it can be done, because it is done in the city of Philadelphia; parties supplying the city with gas at that figure."

What do you understand by that? Does it not convey to you the idea that the consumers of gas in Philadelphia are being supplied at 37 cents? Well, the truth is, that the gas works are owned by the city. On account of not being supplied with all the latest improvements, the city has contracted with *private capital* to supply 3,000,000 feet of gas per day. This is a carbonated water gas of high candle power, and is mixed with the regular city coal gas for the purpose of increasing the output and improving the quality of the gas manufactured by the city works. The consumer of gas in Philadelphia pays $1.50 for his gas as before. This is held as a sample of the benefits of public ownership. This from a teacher of economic science!

Professor Ely presses his point still further, by saying: "It was the best citizens of Philadelphia who insisted that the gas works should remain city property when the gas trust expired."

What scientific or economic value has a reason like that? It is the argument of a politician who knows that but few people analyze the meaning of words. From the fact that he is teaching that a tax of one penny in every street car fare "would relieve to that extent the business men of cities from their load of taxation," it is fair to presume that by "best citizens," he means the respectable wealthy people. *They know*, that the $8,000,000 which they found in their budget of 1887, as receipts from gas (Taxation in American States and Cities, page 271 a,) came by indirect taxation from the larger people who consumed most gas—the majority—who are poor. This is the reason why they insisted that the gas works should remain city property.

The "best people" of Jerusalem crucified Christ. The "best people" of Rome persecuted his disciples. The "best people" of the South held the laborer in bondage. The "F. F. V.'s" of Virginia, hung John Brown who tried to liberate the slave. The "best people" of England are to-day using the power of the government to crush the Irish people, whom they have pauperized. One of our "best citizens" is seeking to ease the burden of taxation for the rich, by collecting pennies from the poor, under cover of charges for gas lighting, electric lighting, street car fares and other products of industry. He advocates an economic theory which must result in the slavery of capital and the pauperization of the people.

Since the days of Hermes, by the use of terms, the people have been deceived.

"MUNICIPAL LIGHTING," BY FRED. H. WHIPPLE.

There are so many difficulties encountered in a proper consideration of the title of this paper, that one does not embrace the suggestion to discourse upon it with enthusiasm. It is a subject seemingly rebellious to analysis, yet one that requires to be treated in language whose clearness is inexorable.

In these times one writes and speaks to the multitude, and upon questions broad in their scope and far reaching in their effects, one ought never to shut himself up in any sort of freemasonry of his own building.

When an issue such as this presents itself to the electric light world for discussion, it should be treated fairly and squarely, with intelligence and judgment, and without the heated arguments of business controversies.

"Municipal Lighting," as generally considered, means the municipal ownership of the plant. I think this definition is erroneous, for the reason that the greater portion of the income of two-thirds of the electric light companies of the country is derived from their public street lighting contracts. Of the total number of arc lights manufactured by private companies who are parties to a city contract, 68 per cent. are public lights, and are paid for by the municipalities. On the other hand, of the total number of arc lights upon the streets of the land, but one-third of one per cent. are owned and operated by municipalities. Therefore, the logic of the subject is not confined entirely to the question of ownership. The issue, to my mind, is based as much upon the rental value of an arc lamp.

What is the rental value of an arc lamp? Statistics regarding the price paid by various cities are not lacking, but comparisons are worse than useless, for they seemingly go upon the principle that a light is a light, no matter what it lights, what it costs to pro-

duce it, whether it has good illuminating capacity, or whether the system be an inferior or superior one. The prices for light vary materially in different places, but I have been unable to see that they vary in accordance with any fixed relation to any other factors which would seem to have a bearing on the service. It may be truly said that nothing has an absolute value. It would be impossible to prove, on a general hypothesis, that 50 cents, or any other sum, is in any place the exact value of an arc light, but in this, as in all other cases, some price must be fixed.

In the staple articles of the world's production, the law of supply and demand regulates prices, but as electric light companies, in their relations to city councils, act under influences individual in themselves, the case is very different. The price of light for commercial purposes is to some extent regulated by the fact that moderate prices materially increase the consumption, but in municipal lighting, the city, if it accepts the terms offered, generally pays the contracted price. It is therefore, in many, if not in most cases, a matter of comparative shrewdness of the officials on either side as to the price paid and the service rendered.

There are to-day in the United States 316 cities and towns, whose streets are wholly or in part illuminated by electric lights furnished under a public contract. The highest price paid for an arc light of nominal 2,000 candle power, burning all night, is $360. The lowest is $40. Between these two extremes there are 186 prices. Upon the moonlight schedule the maximum figure is $165; the minimun, $50.

What makes these wide differences in price? Granted that in many places local conditions, excessive competition, or the absence of all competition have weight in determining the cost of production, what reason shall we give for the varying figures exhibited in a wide field of localities where the conditions are almost absolutely identical?

The average cost of all night public lighting in the United States to-day is $121 per light; for schedule lighting, $110. In 1885 the cost was on an average $167 per light for all night lighting, and $135 for schedule lighting. In 1886 it was $160 and $125. In 1887 it was $130 and $117. In 1888 it was $129 and $114. Thus we find that the price of public lighting has been steadily decreasing for several years, and to a very large extent within the past few months. Contracts that have been renewed since the last meeting of this Association in September show a net reduction upon all night lighting of 23 per cent. and upon schedule lighting of 19 per cent. The general run has been from 15 to 33 per cent., but there are several cases reported where the reduction has exceeded 50 per cent. An increased contract price is rare, less than a dozen in the country so reporting, and the highest figure reached is 20 per cent. while the lowest is 8 per cent.

These satistics do not furnish any guide as to the rental value of an arc lamp. The price paid by one city is often twice as much as that paid in a neighboring city, yet one would scarcely wish to be quoted as saying that the cost of production was in the same relative proportion. It is obviously worth more to produce a light in one place than in another, but is it worth twice as much? It will no doubt be said that different degrees of illuminating candle power enter into the problem, but in my computations I have considered none but nominal 2,000 candle power lights. Sometimes the area lighted is pushed forward in explanation, but this has no connection that I can see with the cost of the light itself.

There is really no basis fixed upon which to charge for public lighting, nor any general data by which a fair rate may be arrived at. I am, therefore, of the opinion, that coincident with the discussion of ownership, should come that relating to the value of the light, for this is really the primal cause for so much agitation of municipal control.

When it comes to the question of ownership there are three parties in interest, the parent companies who manufacture the material to be used, the local companies that have invested their capital in a business they have the natural right to make as lucrative as possible, and the public, represented in an intermediate capacity by municipal councils. Accordingly we find them separate and distinct views taken of the question, and we are forced to believe that all three are right from their standpoint.

Of the three factors the local companies are the only ones presenting a solid front. They are united in the expression that municipalities ought not to do their own lighting. In view of the constant decrease in the price of electric lighting previously shown, and the transitory periods of electrical machinery, the local companies are mechanically correct in their claim to be able to generate electricity as cheaply as a municipality. Many of the circumstances by reason of which the sentiment favorable to municipal ownership became prominent, do not have force to-day. The new and improved formula and the cheapening processes of production, private companies are able to take advantage of where municipalities would not. Compound and condensing engines have made it possible to reduce the cost of power; more light is produced from a less expenditure of energy; carbons have fallen from $50 and $60 to eight and ten; it is no longer necessary to locate a station in the central and therefore the most expensive portion of a city, and more attention is being given to water power. All these are contributory to the claim of the private companies that municipalities should not enter into an investment, the extent of which they are ignorant of, in the face of a declining market.

With the parent companies, the effects of municipal ownership are just beginning to be appreciated. There is no doubt but these organizations will at no distant day be brought squarely to face the alternative of refusing to sell material to municipalities altogether or of going out of business. It has been their custom, while acknowledging an unwritten obligation to protect their local companies, to consider that they are not bound by any special dispensation to refuse a sale when the opportunity presented itself. They are not prepared to say that it is inadvisable for a city to operate its own plant so long as the city already has the other fellow's system installed. When it comes to a city which has a private plant of this or that particular system, then this or that particular parent company is decidedly opposed to the city embarking in the business.

For these truly natural characteristics capital is quickly bringing the parent companies to a halt. No company is large enough or financially strong enough to organize and operate the local companies necessary for the times. Therefore it is local capital and local activity that is the mainstay of the parent company. Capital is always nervous, and we can readily see that with the continued growth of a sentiment favorable to cities doing their own lighting, capital will not run any risks. It will not invest in a city or town where a community interest stares it in the face.

There is another reason why the municipal ownership of plants does not run parallel with the interests of manufacturing companies. In the case of the municipality the net result of a year's operation is public property, while it is to the interest of private corporations to keep within their own knowledge the actual outlays. A larger increase in the amount of goods required may also be expected from them than from municipalities. And from the exasperating incidents of carrying through a municipal deal, with its attendant train of demoralizing influences, every company would fain be freed. I do not believe there is a parent company in the country that has made money by selling plants to municipalities. I know some who have lost money, and I wonder that as a whole they are not ready to commit themselves unqualifiedly and negatively upon the subject of municipal ownership. The time is near when they will be forced to go upon record in this matter, but to-day they are vacillating and uncertain. They believe that in some cases it would be a manifest advantage for cities to own their plant, and in other cases just as manifest a disadvantage. They would like to have each case stand independently.

In considering this subject from the standpoint of the public servant, it becomes at once a question of advisability, to which is naturally attached, although seldom considered, the element of responsibility. The theory of the political economist is that the monopolies of service should be owned by the municipality, and all belong to the community. In European countries this idea is carried to a much further extent than in our own. In many English speaking communities the public service does not stop with light, water and transit, but municipal ownership often extends to the bath, the laundry and the bakery.

It has been more gradual in America, doubtless because the tendency of the times in all municipal governments is toward political aggrandizement, and that it inevitably leads to corruption and a debauchery of the public service. It has therefore become necessary to largely restrict the functions of the local governments by more general legislative bodies. In America, politics is the national characteristic, and the ordinary politician is only theoretically honest. He recognizes moral turpitude only to the extent of dreading exposure of his own backslidings, and while if he break the law, he nevertheless outwardly insists on the sanctity of the law. Municipal service can be, and ought to be, administered with quite as much freedom from assumption as when in the hands of private parties. But in few instances do we find it so administered. We are thus confronted with a condition, not a theory, and in the municipal ownership of electric light plants this condition is easy of demonstration. I believe I can truthfully say that the experience of city governments in this line has not been in all respects satisfactory. Starting out a year ago as the investigator for a large municipality, I have closely studied the workings of almost every city plant, and with but one or two exceptions I would not now commend their operation. The officials of the smaller towns where municipal plants have been installed, with an amount of crude ignorance of the subject that is truly appalling, do not hesitate to assert that they and the people are well satisfied with the experiment, but in the majority of cases these officials are in office largely through the machinations of rings, and it would not be in the line of policy for them to decry the schemes of their associates.

The illumination of towns by themselves is on the intermittent plan of lighting, the hours varying so that no basis for comparison can be arrived at. The average advocate misinforms the investigator by holding up to view the proposition that these cities are doing their lighting for a mere nominal cost, while his figures are really superficial and not entitled to support. They are figured on isolated conditions to suit the emergency, often with items charged to other departments for the sake of a plausible showing in the lighting account. On one occasion, where I was called upon to estimate the cost of all night service for a large city, upon its merits, my figures were $92 per year, with interest and depreciation, and that I think is not very far from the cost of an arc lamp in our average communities.

A strong claim is made that notwithstanding the prejudicial influence of politics that enter into their management, municipal stations have reduced the cost of public lighting in their localities over the contract system.

I have previously stated that the average present price of public lighting in the United States is $121 per arc lamp per year, burning all night, and $110 per lamp burning on schedule. The average cost to municipalities which are furnishing their own light, is $76 for an all-night light, and $44 for what they term a schedule light. This schedule is deceptive and does not provide for as many hours lighting as the usual contract does. Therefore the latter suffers by comparison. It is often the case, also, that the light is furnished in connection with some other department which bears a portion of the interest and depreciation account. Free water power and sometimes so-called free attendance also enters into these figures and distorts them.

The only argument worthy of consideration in favor of municipalities doing their own lighting is that of cheapness, and emphasizes what I have said in a previous part of this paper, that an important question involved is the rental value of an arc lamp.

Municipalities have not yet succeeded in reducing the price of light abnormally below the average. I do not consider the fact of any weight that a city, by reason of its not being compelled to pay taxes, and because it has no profit to make, can manufacture light cheaper than a private company, for I expect that what it saves in this way will be counterbalanced by losses caused by the influences of its management.

Here arises the question of a personal financial responsibility. We have become accustomed to consider that all public business, being in a sense everybody's is really nobody's, and too often it is the case that a mere perfunctory public duty is performed for the sole sake of the salary attached to the office. Any business enterprise to be conducted successfully, ought to be carried on by men who are financially interested in it, and who feel in their own pockets the cost of every expenditure. A city government cannot possibly take that view of it, even though its departments were paved with good intentions.

There is but one view, and that a constitutional one, in which municipal ownership can be endorsed. If the expenses of the plant can be kept within reasonable bounds; if the management is in all respects such as you would commit your own private business to; if there are no outside prejudicial influences; then from the standpoint of the public servant, it would be desirable for some cities to do their own lighting. Without these qualifications it would be inadvisable.

The price of public lighting has outstripped all other questions in the financial management of our cities. It has become, if not the chief source of expense, the greatest bone of contention, and the electric light companies that will observe the handwriting on the wall and meet the subject half way, will do much to dissipate this sentiment antagonistic to its interests.

This is room for improvement in public lighting. Contracts are not made by people living in a millenium, but by the mingled good and bad as they are found in the business world and municipal councils, and as they probably will be found for some time to come. There are several sides to this, as to all questions, and there is a happy medium. In this medium the electric light fraternity should clasp hands with the well-meaning and observant public servant, and see to it that while fair profits are returned for the service rendered, a union of interests is formed, cordial in its nature, though commercial in its results, and there will then be no occasion for public sentiment manifesting itself in the municipal ownership of electric light plants.

Electrical Engineering at Cornell University.

The Department of Electrical Engineering at Cornell University was established in 1883, and from a small beginning, made under the direction and in accordance with the suggestions of Prof. W. A. Anthony, now consulting electrician of the Mather Company, it has grown to be the second largest course in the University. It numbers this year 121 students. On account of the growth of this department in Sibley College, the faculty have been obliged to make the appointment of another professor in electrical engineering. Cornell University stands high in this department of instruction. The electrical laboratories of Cornell University have been fully equipped for the study of this branch of engineering. A great variety of instruments have been brought together for measurements of resistance, currents, electro-motive forces and capacities. A number of electric lighting systems are in actual operation, among them the Thomson-Houston, the United States, the Westinghouse, the Edison and several others. Students in the department have practice in every kind of electrical work, including measurements, tests of the condition of telegraphic, electric light and power lines and cables, tests of locating faults, and dynamo construction, etc. A careful study is made of the principal systems of electric lighting, both arc and incandescent, transmission of power, and the storage of the electric current. As the department now has dynamos and motors of nearly all of the existing systems, the efficiency and construction of these may be readily investigated. The theory and construction of electric machinery, and the maintenance of electric light and power plants are made a special study. For magnetic and other measurements by the magnetic needle, a special building has been erected entirely free from iron; copper being the only metal used in the construction. In this are placed the magnetometers and instruments for accurate measurement of currents and potentials; one of the latter being the large tangent galvanometer constructed at the University under the direction of Prof. Anthony, and said to be the largest in the country, with coils respectively one and six-tenths and two meters in diameter and giving deflections to ten seconds. By this instrument currents from one milliampere to 250 amperes can be accurately measured. Among the late contributions to the equipment of the laboratories at Cornell are dynamos and lamps from the Edison, Thomson-Houston, and Westinghouse companies; motors and storage batteries from the Brush Electric Light Company, together with a complete incandescent system from the Westinghouse Electric Company, which will soon be utilized in lighting Sage College. An electrical engineering building is soon to be constructed which will add immensely to the advantages of this department.

A New Topeka Electric Light Company.

The Jenney incandescent electric light plant started up Friday of last week with 300 lights. The Kansas Electric Company did all the wiring. A Ball engine of 125 horse-power is used. The officers of the company are: J. Riley, superintendent and general manager; H. Safford, president; Wm. C. Knox, treasurer; H. C. Rynerson, secretary. The name of the company is the North Topeka Light and Power Company, located in North Topeka, Kans.

—— Wilmington, Del., is proud of its new electric light plant, just ready to be turned over to the company by Electrician W. S. Heger, who has completed his work. The plant consists of a Ball engine of 15 inches diameter of cylinder and 16 inches stroke. The engine works under 80 pounds of steam to the square inch, making 220 revolutions per minute, developing 130 horse-power. The electric current generated is from a 1,000 volt Brush machine and a 100 volt Edison dynamo. These machines supply 1,000 sixteen candle power incandescent lamps and 42 arc lights of 2,000 candle power each. The lights are all controlled by switches in the engine room, and the wires are so arranged that an accident to them anywhere in the works is felt and controlled in this room. An electric meter accurately measures the current and indicates to the attendant just how much force he needs to supply the lamps that are in use.

CONVENTION ECHOES.

A FEW RAMBLING REMARKS, PERSONAL AND OTHERWISE, CONCERNING THE CHICAGO CONVENTION OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION.

The Eastern delegates were greatly astonished over the prevalence of dirt in the Garden City. In all the range of cities visited by this itinerant Association, Chicago carries off the palm in this respect. It is the result of the extensive use of soft coal.

The elegant special train chartered by the New York delegates was the talk of the Convention. A neat little conspiracy is here reported for the first time. The delegates from New England and Boston came out in a special *car* over a northern line, while the New York delegates were enabled, owing to their number, influence and standing, to secure a special *train*, and came out on the very fast time made by the Pennsylvania limited. Before arriving in Chicago it was arranged to have a number of type written passes printed, which, upon being signed by Mr. Geo. F. Porter, chairman of the transportation committee, would permit the bearer to inspect this special train, and these were generously given out, but apparently it required great effort to secure them. The New England delegates and others, who after a great deal of trouble and solicitation were able to secure one of these passes, are now informed for the first time that what apparently was so hard for them to secure had been prepared by the score, and were neatly done up in the pockets of some two or three gentlemen in the secret. However, the train was worth the visit, for it was said to be the finest train ever sent out by the Pennsylvania road, and that is saying a good deal.

The *Daily Graphic* published the following concerning the special train to the Chicago Convention: "Not a few of the Pennsylvania officials about the Jersey City depot are laughing over what they think is a good joke on the electricians. The Pullman people have recently decided to discard electric light for palace cars and to substitute gas, and these cars were among the first that have been fitted up with gas." We think our illustrated daily contemporary greatly mistaken. Any how, the entire special train on this occasion was lighted by electricity, and very successfully lighted, the entire trip passing off without a single hitch. One if not two of the cars of the train had never been used before, in fact had just arrived from Pullman, Ill., and made their first trip as part of this special train, and, as they had been specially built for lighting by electricity, we do not think the Pullman people are discarding electric light for gas. A well-known electrical gentleman of this city suggests that the *Graphic* intended to convey a dark and insiduous meaning about gas in the cars resulting from the vociferousness of the bright and lively gentlemen composing the electrical party.

By the time the Eastern delegates had been in Chicago two days they found that all refreshments were barred after 12 o'clock at night. To make amends for this a few of them, including Stanley, of Bridgeport, Baker, of Newark, Patterson and Candee, of New York, Cleverly, of Philadelphia, and others, ordered a very elegant and substantial supper to be set out in the rooms of a trusted friend at the Hotel Richelieu at 12.30 A. M., which they thought would be about the time they returned from the theatre. They were a little late. Said trusted friend, not being in the secret, arrived at his rooms about 1 o'clock, found this elegant repast with no one to enjoy it. He immediately started on a tour of discovery and succeeded in capturing Fred. A. Gilbert, of Boston, with an enormous appetite, and half a dozen other friends, and in half an hour the elegant supper had all been disposed of. At this agreeable moment, the door opened and in filed the first-named gentlemen, each with the keenest of appetites, having stayed out later than usual exercising in the blizzard so as to particularly enjoy the novelty of a fine meal after 12 o'clock at night in the city of Chicago. The expression on their countenances as they realized that their supper was gone cannot be described, neither will their remarks be recorded here.

The special car from Boston brought 23 delegates, and was under the fatherly direction of Colonel Ransom, of *Modern Light and Heat*, assisted by Messrs. P. H. Alexander and Frank Ridlon.

Mr. Marsden J. Perry, of Providence, was discovered to be quite an orator, and his neat little speech nominating Mr. E. R. Weeks for the presidency was greeted with applause. He and the Hon. Edward A. Maher, of Albany, carried off the honors for good looks, leaving out, of course, the newspaper men.

A gallant fight was made by a number of St. Louis gentlemen to have the next Convention held there, but the reputation of that city in the matter of hot August weather killed it.

Mr. J. B. Ecclesine, of New York, made his first appearance at this Electric Light Convention, representing the Cobb Vulcanite Wire Company, of Wilmington, Del. Mr. Ecclesine made many friends for himself and company, and both he and Mr. Cobb will no doubt be regular attendants hereafter.

Mr. E. F. Gennert, of New York, had with him on the special train from this city, a very complete little camera, and is reported to have taken a number of instantaneous photographs which possess great interest to the parties photographed. Their appearance is awaited with some trepidation, as several of them were taken at meal time.

The Central Electric Company had a polite colored boy with the Okonite trade mark emblazoned on his shirt front as an attendant during the Convention, and so that none may forget him, he was photographed and his picture given out to all visitors.

Mr. S. A. Barton, who is at the head of the Thomson-Houston interests in the West, renewed acquaintance with a great many of his Eastern friends who were attending the Convention.

President E. M. Barton, of the Western Electric Company, and Manager C. A. Brown, were regular attendants at the session of the Convention, if we except the time that the latter-named gentleman was engaged in serving his country on a jury.

Prof. John P. Barrett, so widely known as the electrician of the city of Chicago, took an active interest in the work of the Association, both in the Convention and in assisting to make the visit of the electrical people pleasant. He was most decidedly successful. Professor Barrett made a fight to have the matter of underground wires receive attention, and after a little lively discussion, and some unnecessary scare on the part of the central station men, the point Professor Barrett made was agreed to and the former committee continued, and Messrs. Barrett, B. E. Sunny and Elmer A. Sperry added to it, making a committee of eight, the other gentlemen being Messrs. Eugene T. Lynch, Jr., C. H. Barney, Walter C. Kerr, I. H. Davis, F. B. Crocker. This committee is to report at the Niagara Falls Convention.

Col. George L. Beetle was indefatigable in the matter of most cheerfully greeting his many friends, all of whom were greatly pleased to see him looking so well.

Mr. F. A. Cheney, of Elmira, New York, was one of the Convention attendants from this State, and is one of the coming men in the Electric Light Association.

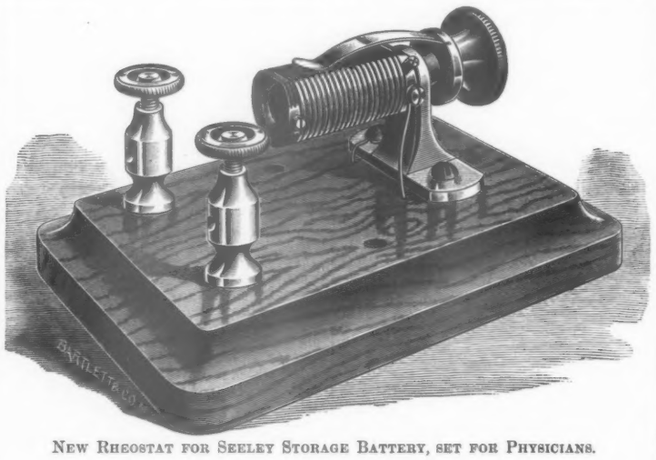
Charles A. Cooper, president of the Municipal Electric Light Company, of Brooklyn, after an absence of one year from the Association, showed up in his usual energetic style at the Chicago Convention, and was warmly welcomed.

The dinner given to the members of the executive committee and officers of the Association by Messrs. Sunny and Kreidler of Chicago, also included the electrical newspaper men. It was given, as before announced, at the Union League Club, and was greatly enjoyed.

M. A. Knapp, of Chicago, is one of the handsome men of that city who devoted himself to seeing that out-of-town delegates were well entertained.

Mr. C. R. Huntley, of Buffalo, one of the the new members of the executive committee, met a great many friends at Chicago. He is a progressive and enterprising gentleman, and will make a valuable member of the committee.

J. P. McQuaide, the good-looking representative of the National Conduit Manufacturing Company, although representing an interest that the electric light operating companies look at askance, has many friends among electric light companies and made many more at Chicago.



NEW RHEOSTAT FOR SEELEY STORAGE BATTERY, SET FOR PHYSICIANS.

The thanks of the REVIEW are due to Mr. W. A. Kreidler, editor of the *Western Electrician*, for numerous newspaper courtesies extended its representatives at the Convention.

Marmaduke M. M. Slattery came up from Fort Wayne, and matters which had been halting and hesitating upon his arrival at once proceeded in symmetrical and eloquent style.

Fred. W. Royce, of Washington, made many sacrifices to attend the Convention, but without his presence the Association would not seem natural, and although he was busily engaged in wiring the new Pension building, which is to be lighted by electricity for the inaugural ball, he immediately responded to the summons to be present in Chicago, leaving his work so suddenly that he arrived with his pockets filled with double-pointed tacks, a pair of pliers in his boots, and a coil of wire around his neck.

George F. Porter, chairman of the transportation committee (and we don't think the transportation committee was appointed for the next meeting), again covered himself with high honors. We think Mr. Porter deserves a great deal more credit than he has ever received for the work he has done in securing reduced rates to these Conventions, and also for the important part he has always borne in getting up excursion parties to attend them.

Mr. T. C. Smith, of Philadelphia, is a capable, far-seeing, electric light worker, and his sensible words, both on and off the floor of the Convention, had a good deal to do with the general success of the meeting.

Friction clutch pulley men were present in first class order. Mr. Schenck went on from New York and formed many new and agreeable acquaintances among the electric light men.

Captain C. H. Thompson, of the Woodward Electrical Works of Detroit, carried off the honors as champion story teller of the Convention, and this was no easy contest either, for there were a number of artists in attendance.

The best local report of the Convention was made by the Chicago *Inter-Ocean*, which paper from the start realized the importance of the meeting, and handled it accordingly.

Following the plan of *Modern Light and Heat* at the Boston Convention, the *Western Electrician* published a very complete and handsomely printed daily during the Convention. It contained the complete proceedings of each day, and was issued every morning.

Col. A. B. Uline, of Albany, was one of the prominent telephone men present, drinking in new electrical information from the electric light and electric power men.

Chas. W. Ward, the general manager and head of the Non-Magnetic Watch Company of America, attended his first Electric Light Convention, and enjoyed it so much that he will not miss them any more.

Mr. Jarvis B. Edson started the plan of organizing little dinner parties on the special train from New York, and the idea became very popular. The meals served by the railroad company in the dining car were elaborate and appetite-satisfying successes. Every patron was delighted.

The summer convention at Niagara Falls is already talked of as being a suitable occasion for delegates to take their wives.

A great many of the delegates to the Chicago Convention visited the large factory of the Western Electric Company, and enjoyed a trip through its many busy departments.

The Columbia Theatre, of which Manager Morton is the courteous and energetic head, is beautifully lighted with electric light, which is most admirably controlled. This theatre was one of the popular resorts of the attendants of the Convention, and many of them were privileged to examine the details of the excellent electric lighting arrangements.

Another interesting theatre lighted by electricity is that of the Haymarket, on the west side, which is under the direction of Manager Davis. There are a number of electrical effects in the disposition of the lamps, and the theatre in addition to being lighted by electricity throughout, has the honor, we believe, of being the first to have respect for the comfort of the actors, the dressing rooms being conveniently and tastefully fitted up.

The credit for the artistic decorations of the Convention hall and press room belongs to Mr. F. H. Soden. These decorations were gotten up in the best taste, and won warmest praise from all visitors.

The exhibitors expressed great satisfaction with the Chicago arrangements and felt more than repaid for their trouble and expense.

The attendance at the exhibition constantly increased from the opening day. On Thursday 18,000 tickets were taken in between 4 and 7 o'clock P. M., and 5,000 people were turned away in the evening. At times the crowd outside the building became so large that the police patrol was called to preserve order and protect the ladies, of whom there were a large number present. The doors were closed at 8.30 P. M., and it was stated that never since the Blaine Convention in 1884, had the Exposition Building held so many people.

The special train that carried the electric light delegates from New York to Chicago was lighted throughout by electric light, wired by Okonite wires, a Brotherhood engine and Eickemeyer dynamo being used to generate electricity. The plant was in charge of Mr. J. K. Park, and the incandescent lamps throughout the train were of the Sawyer-Man make. The cars were all new, two of them never having been used before, and both the Pennsylvania Road and Pullman Company are entitled to the thanks of the New York delegates for the magnificent train they placed at the disposal of the party and for the splendid manner in which the train was handled from the time it left New York until it arrived in Chicago just 24 hours later. City Passenger Agent, H. M. Haines, went with the party and was assiduous in the work of looking after the comfort of the passengers. The trip was the most successful and pleasant one ever made by so large a party of electrical people, and the cars were so conveniently arranged that the pleasure of one never interfered with the comfort of the other.

A Convenient Rheostat.

This handy little contrivance will find other uses besides its application to the Seeley Medical Storage Battery, for which it was specially designed. It is very simple, consisting of a spool of insulating material wound externally with resistance wire, and mounted on a pedestal. Its bore serves as guide for a pin which carries the sliding contact above. It is admirably adapted for all purposes within its range, and does Mr. Seeley credit, and the Complete Electric Construction Company, the owners, will find an increasing demand for it.

THE GREAT ELECTRICAL EXHIBIT.

ADDITIONAL NOTES CONCERNING THE ENTERPRISING EXHIBITORS AT THE CHICAGO ELECTRIC LIGHT CONVENTION.

Several columns of the REVIEW last week were devoted to descriptions of the various interesting exhibits that the progressive electrical men presented at Chicago. In this issue several columns of the "overflow" will interest every reader, and bring honorable recognition to gentlemen abundantly deserving of it.

Mr. E. B. McClees, of New York, represented the old reliable Kerite wires and cables and made many new friends among the electrical people.

Mr. J. H. Shay, of the Munson Belting Company, was very successful in greeting all visitors. His company's belts were in use throughout the Exposition building.

Mr. T. H. Brady had his mast arm on exhibition, and, as usual, attracted much attention from all visitors.

Mr. Theodore Larbig represented the New York end of Holmes, Booth & Haydens, and presented a neat exhibit of bare and insulated wires.

Mr. Jarvis B. Edson exhibited several of his pressure recording gauges—a gauge that is increasing in popularity with electric light people every day—and in the same room the Detroit Lubricating Company showed samples of their oils.

Mr. W. C. Wonham, of New York, presented a magnificent exhibit of the Hill clutch pully. Mr. H. W. Hill was in attendance. The new Hill clutch, of an entirely new pattern, and not yet on the market, was a feature of the exhibit. Mr. C A. Burns, of Chicago, and Mr. H. M. McArthey, of Minneapolis, were also with the exhibit.

The Stilwell & Bierce Company, of Dayton, had a very interesting exhibit of their widely known Victor Turbine, also their live steam purifier. This exhibit was in the outer hall, and was visited by every attendant. The company was represented by Mr. F. A. Brooks with the turbine wheels, and Mr. R. B. Day with the purifier and steam department.

Occupying a prominent position near the entrance of the main hall were two of the well known Brady Mast Arms, 15 and 21 feet in length. The arms were shown with lamps attached. Mr. T. H. Brady was present personally.

Mr. Charles W. Russell, of Providence, representing the Russell Manufacturing Co., exhibited two mast arms 15 and 25 feet long respectively, and with lamps attached. The peculiarity of the Russell arm is that the lamp is brought to the pole instead of lowered, and the electric wires are concealed in the main shaft of the arm.

The Geo. F. Card Manufacturing Company, of Cincinnati, Ohio, were represented by Mr. J. F. McClure, general manager, and Mr. E. B. Richart, electrician. The company made a large exhibit of dynamos and motors, in the installation of which for isolated points they are doing a large business. A time meter, just patented, was an interesting feature of the exhibit. It is an apparent clock with dial face, and by it the current records the exact number of hours that the motor or lights are used. It has an advantage of cheapness, and is intended to fill a long-felt want among motor and light men.

The Chicago Engineering Supply Company, represented by Mr. John Boylston, made an exhibit of the Detroit Lubricators and engineering supplies in general. This company has the agency of the Edson recording gauge and carries a line of fine lubricating oils.

The Chicago Feed Water Heater and Purifier Company was well represented by President J. O. Wilson, Vice-President Thomas Kane, Mr. R. E. Richardson, secretary and treasurer, and Mr. James C. Watson, master mechanic. They exhibited the Smith purifier, for which new device many advantages are claimed.

The Ashton Valve Company, of Boston, represented by Mr. A. J. Hewlings, made an elaborate exhibit of their well-known "pop" safety and water relief valves. The fine finish on these goods was the subject of favorable comment.

The St. John's self-adjusting cylinder packing exhibit was in charge of Mr. H. C. Higgins. The company is prepared to stand by the statement that their packing possesses advantages of economy of fuel and oil. They exhibited a ring with their packing which was used at the Institute fair, where it received first prize.

The "Dynamo" belt was exhibited by the Goulds, Austin & Caldwell Company, of Chicago, who showed also the monarch belting and Lunkenheimer valves.

In the outer hall the Eureka Fire Hose Company, represented by Mr. C. A. Landy and R. H. Salter, made a good showing with their cotton machine belting.

The Locke Bros. steam damper regulator, an apparatus which has met with favor in its field, was exhibited in the outer hall by the Locke Bros., of Salem, Mass., represented by Mr. H. B. Ham.

An Edson steam pressure recorder of unusually fine finish and having the new ink marking device, was loaned by its owner, Mr. H. M. Kinsley, of Chicago restaurant fame, for use in the exhibit of Jarvis B. Edson, of New York. It was illuminated by an Edison lamp, and attracted much attention from electric light men whose questions were readily answered by Mr. Edson himself, demonstrating how indispensable these recorders are where economy of fuel and uniformity of speed are so essential as in electric lighting.

The Bernstein Electric Co., represented by Mr. H. B. Cram, treasurer, exhibited in department A, their series incandescent lamps in operation on different arc light circuits. A distinctive feature of this lamp and socket is the use of insulating material for all outside parts, thus preventing any possibility of contact with the high tension current used.

E. B. Preston & Co., of Chicago, exhibited a 60-inch double leather belt about 130 feet in length, made for the Pullman Palace Car Co. This monstrous belt weighed about 1,200 pounds and is said to be the largest belt ever exhibited. They also exhibited a superior line of leather belting for high speed dynamo work. E. B. Preston & Co. are one of the largest houses and their Acorn brand of Short Sap leather belting is particularly popular.

The Detroit Motor Co. made a fine showing of their motors in department A. The display consisted of dental, jewelers, fan, sewing machines and other motors ranging from $\frac{1}{12}$ horse power up to eight horse power. Some of the strongest financial men of Detroit are interested in this company, and it will actively enter the motor field. The inventions are all the productions of H. H. Blades, a young man only 19 years old. They also exhibited an automatic switch recently invented. The Blades motor is a handsome, strongly built machine.

The Detroit Storage Battery Company, represented by General Manager Frank B. Trout, made an extensive exhibit in the main hall, with headquarters in Department A. It is one of the strongest and most perfect batteries ever invented, and will be technically explained in the REVIEW soon. Captain C. H. Thompson, the original inventor of this battery, was also present and explained its construction. Mr. C. C. Jennings, formerly of Chicago, and well known among the electrical people of that city is now with this company and attended the Convention.

The Knapp Electrical Company covered a large floor space in Department A, and was represented by P. C. Burn, St. Louis, and M. A. Knapp, the General Manager of Chicago. Mr. J. W. Godfrey, of Grimshaw wire fame, also made his headquarters here, as did Mr. P. C. Ackerman, with a fine line of the popular wire of the American Electrical Works.

The Belding Motor & Manufacturing Company, Chicago, exhibited two half horse 110 volt, two one horse 110 volt, one two horse 110 volt, one two horse 220 volt, and one seven and one-half horse 220 volt machines; also sewing machine, dental and small fan motors running from both primary batteries and incandescent circuits. The Belding people have only been in the field a short time, but claim to have more machines in operation in Chicago than any other company. The exhibit was represented by Mr. H. G. Brownell and Mr. Coale.

The Chicago Rawhide Manufacturing Company made a superior showing of variety and styles of belting from 16 inches down to the smallest belt ever made. In their exhibit was the flat, round twist, rope and square beltings. One of their 10-inch belts was used to drive a dynamo with a 12-inch double belt and two 4-inch double belted dynamos. The Chicago Rawhide Company's belts have been used on high speed dynamos in Chicago for nearly nine years and are apparently as good as ever. The Chicago Rawhide Manufacturing Company have one of the most durable and practical belts in the field for high speed work. They were represented by W. H. Preble, A. B. Spurling, W. P. Preble, and D. R. McCutchen.

The National Electric Light Company, of Eau Claire, Wis., came in for a strong share of both electrical and public interest in the work done in both arc and incandescent lighting. The beautiful light in the press room was by this company's incandescent system. Their improved dynamo was located in the north end of the hall and constantly surrounded by a curious crowd of spectators. The National Company have an electrician in the person of Mr. Freeman who is well-known to electrical people.

The Electrical Supply Co., of Chicago, occupied the northeast corner in department A covered by a canopy and lighted by both arc and incandescent lamps. Besides their general line of electrical goods they exhibited superior test instruments, Sawyer-Man lamps, the Dayton lift and tackle, the automatic ground switch, showing its use on both incandescent and arc lights. The automatic arc lamp hangers were shown from the center of the canopy. One table was devoted entirely to vulcanized fibre, while a large department was devoted to Cobb vulcanite wire and cables. The Electrical Supply Co. not only made a splendid showing in their spacious apartments, but they strung the P. & B. wire all over the building as a fence for the various exhibits. The exhibit was represented by Mr. Terry, Mr. Neely, Mr. Cone, and Mr. Taylor.

Hugo Meyer & Co., had a neat exhibit of cotton, silk and worsted yarns for covering magnet wire, telephone wire and for insulating wires. They were represented by Fred. Moss, New York.

The Sperry Electric Company made a splendid showing of this improved lighting system—in fact it was one of the most attractive exhibits of the Convention, and everybody who called was welcomed and shown all through the department in a most courteous manner by Mr. D. P. Perry, general manager of the Sperry Co. and by Mr. Fred. De Land. They made a special showing of their systems using two ten arc light dynamos, one showing new high tension system and the other the new low tension system. On the high tension system 10 lamps were suspended from a bracket and were alternately in and out of circuit in order to show instantaneous automatic action of the regulator. This regulator has excited a great deal of interest.

Mr. Elmer A. Sperry made a special exhibit of his mining drill, operated by a Sperry motor which attracted a great deal of attention. These drills have been in use for some time in the coal mines of southern Illinois, and have given good satisfaction.

The Excelsior Electric Light Company's exhibit was the neatest at the show in point of drapery and arrangement. A bridal chamber lighted by both arc and incandescent lamps, in the center of which was hung a beautiful portrait of Chairman B. E. Sunny, taken by electric light which Mr. Horne says they can make complete in 2½ hours from receipt of the picture, the Excelsior light doing nine tenths of the work in 15 seconds. They exhibited two 15 horse power dynamos furnishing the current for all the arc light motors throughout the building, the regulators on the dynamos responding quickly and efficiently to all the demands for throwing on and off the motors of the various exhibits. The were represented by F. W. Horne, Chicago, manager.

Parrish Bros. and Peck, Electrical Co., of Detroit, exhibited their electrical circuit for passenger and freight trains, steamboats, burglar alarms, etc. They are a genial company of gentlemen with some very valuable and simple electrical devices which have been thoroughly tested and highly recommended by Michigan Central Railroad officials. They were represented by M. W. and M. S. Parrish, Dr. J. H. Carstens and F. H. Clark, Detroit.

The U. S. Rocking Grate Co., of Chicago, exhibited the finest rocking grate. It is perfect in its work, self cleaning and has been tested and highly recommended by a long list of engineers.

Chas. A. Schieren & Co., of New York and Chicago, exhibited a full line of their superior leather link belting and electric leather belting, among which was a 48-inch electric belt sold to the Municipal Electric Light Company, of Brooklyn, a 40-inch electric belt sold to P. & W. Ebling, New York, a 20 and 14-inch electric belt sold to Arthur & Warner, of Portland, Ore. They also exhibited a 14-inch perforated electric belt which is their latest improvement in electric belting for high speed purposes. Chas. A. Schieren, Jr., E. L. Burnell and F. W. Baugher, represented them at the Convention.

The Kester Electric Company, of Terre Haute, Ind., exhibited their new electric motor which has recently been perfected, the main feature of which is the peculiar winding of the armature. They were represented by J. Berry, J. H. Briggs, Clint Kidder and J. F. Kester, of Terre Haute.

The Chalmer Spence Company, represented by T. K. McKnight, Chicago manager, exhibited a complete line of their asbestos pipe and boiler covering, piston and valve packing, asbestos board and building paper.

An exhibit which arrived late, but which attracted much attention, was the Whittingham Switch for starting and stopping incandescent motors with no possibility of injury to the motor. The exhibit was made by the Automatic Switch Company, of Baltimore, and Mr. G. H. Whittingham was present to personally explain the operation of his switch.

The Tamarack and Osceola Copper Mfg. Company was represented by Mr. S. Rosenstamm, of Lewisohn & Bros., of New York. The exhibit included samples of different sizes of pure lake copper wire. The company has been in existence but a comparatively short time, but is meeting with great success.

The Cobb Vulcanite wires were used in the conduit exhibit. Mr. Henry B. Cobb and Mr. J. B. Ecclesine were prominent attendants at the Convention and exhibition. The Cobb Co. also had an extensive exhibit in department A.

The American Electrical Works of Providence, represented by P. C. Ackerman, showed a magnificient line of magnet and annunciator wires and flexible cords. The cable used in the Russell mast arm is from the American Company, and is a fine example of thorough work in the line of heavy insulated cables.

The Pumpelly Storage Battery and Electric Motor Company made a large exhibit in the outer hall, and were represented by Mr. Abner Crossman, president; Mr. Geo. W. Marble, general manager; and Mr. L. Mendelsohn, treasurer. They made an exhibit of Pumpelly storage batteries and successfully overcame many difficulties. There was a delay in getting current, and consequently the batteries were run as they were brought in, but half charged, but nevertheless made a good and satisfactory showing. Twenty-six cells were employed lighting 14 incandescent lamps, beside running a cloth cutting machine and Belding electric motor.

The Wheeler reflectors were exhibited in the large hall.

The New York Safety Steam Power Company exhibited an 85 horse-power automatic engine, which was furnishing power for several dynamos of the National Electric Manufacturing Company. In addition, an upright six horse-power engine was running another dynamo. Several of this company's engines are in use in Chicago, including 125 horse-power at the Merchants' plant and 25 horse-power at the Tremont House. The company was represented by Milton Thomas and C. L. Klock.

The most unique exhibit at Chicago was that of the Fort Wayne Jenney Company, which was in the outer hall about 20 feet from the floor, and read as follows: "This space in the air reserved for the Fort Wayne Jenney Electric Company. Owing to the recent fire and to the fact that we have now on hand orders aggegating $14,000,000, we are compelled to forego the exhibit of apparatus expected of us by our friends. We have plenty of nerve, but no machinery to spare, hence this display of our only available merchandise. We will be pleased to see our friends at 185 Dearborn street. W. J. Buckley, Manager Chicago Office."

A novel little machine shown at the exhibition for the first time, was a cloth cutter, the invention of Mr. H. A. Caldwell, of Chicago. It consists of a razor-edge knife held in vertical position, and given an up and down motion with a slight push ahead, by a ⅛ horse-power "C. & C." motor revolving at a high speed. This little device, which cuts easily through 50 thicknesses of heavy cloth, was driven a part of the time at the "C. & C." exhibit, another ⅛ horse-power motor acting as a dynamo furnishing current, and the Pumpelly storage battery furnished current while the machine was being shown in the outer hall.

The Mosher Tubular Metallic Packing was exhibited in the outer hall by Mr. Thomas B. Mapp. This packing is made by Charles F. Elmes, of Chicago.

Henry R. Worthington exhibited a complete line of the well-known Worthington pumps and meters in the outer hall near the engine exibits. Boiler feed pumps, power pumps, etc., were included.

The engine exhibits formed an important feature in the large exhibition hall.

A. L. Ide & Son of Springfield, Ill, showed a large Ideal engine, made for and sold to the Chicago Edison Company for the Adams street station. The company was represented by Mr A. L. Ide and Mr. W. B. Pearson.

Fairbanks, Morse & Company, of Chicago, exhibited a Williams Automatic Engine of 90 horse-power.

Mr. Daniel H. Higgins had in operation one of his rotary steam engines of two horse-power running a small dynamo.

The John T. Noye Manufacturing Company, represented by Mr. J. M. Duncan, Western agent at Chicago, and Mr. C. A. Miller, had a large Rice Automatic engine furnishing much of the power used in the exhibit. A new engine just from the shop was started up under a full load but no trouble was met with, and the work required was satisfactorily done. The Western agency of this company, though established but five months, has already placed 50 engines.

Connected with the Rice engine was a large exhibit of pulleys, shafting, couplings, clutches, etc., from the Eclipse Wind Engine Company, of Beloit, Wis., all in active operation. The oil cups in this exhibit were those of P. A. Bennett, and the Munson belt was used.

The exhibit of James W. Queen & Company, in department A, was alone worth a visit to the exposition, and contained a most complete collection of electrical testing instruments, together with portable batteries, photometers, etc. Mr. R. O. Heinrich represented the company, and among other things pointed out the new standard ampere balance here exhibited for the first time in the United States.

The North American Underground Telegraph and Electric Company made a large exhibit of the Johnstone conduits, whose construction and workings were fully described recently in the REVIEW. Mr. W. H. Johnstone, Mr. Clarence W. Meade, Mr. John R. Geary, Mr. W. F. Smith and Mr. Chas. Selden represented the company.

Telephone News

⁂ The Boston aldermen have voted to permit the New England Telephone Company to lay underground conduits in Milk and School streets.

⁂ During the past year the Wisconsin Telephone Company has built 329 miles of lines in the State. During the coming year it is proposed to extend the lines from Monroe to Darlington, Mineral Point to Dodgeville and Highland, Lancaster to Platteville, Georgetown to Dubuque, Ia., and Galena, Ill.

⁂ The complainant, Dr. Rogers, in the Pan-Electric case of Rogers against Garland, says he intends to summon President Cleveland after the 4th of March to testify as to statements in regard to the Pan-Electric Company alleged to have been made to the President by Mr. Garland, Casey Young, Senator Harris and others.

⁂ The telephone company has cut the wires of the Woburn (Mass.) Electric Light Company between Fowle street and Winchester. The companies have disagreed for some time regarding their respective rights, and the electric light company placed wires on the poles after being requested not to do so. The wires which furnish the light on the thoroughfares of Winchester were allowed to remain.

⁂ The extent to which the telephone has entered into Connecticut social and business life is graphically shown by the summary of the figures in the Southern New England Telephone Company's annual report, which has been just issued. There are 2,586 circuits in the State, 6,981 miles of wire, of which 753 are copper, and 5,710 stations, 2,793 of which are business places, and 194 persons are given employment.

⁂ The annual election of the Wisconsin Telephone Company resulted in the choice of the following officers: President, Henry C. Payne; vice-president, C. H. Haskins; secretary, John D. McLeod; treasurer, F. G. Bigelow; directors, E. H. Broadhead, B. K. Miller, H. C. Payne, C. H. Haskins, George Albee. The directors have re-elected F. E. Parker to the office of superintendent. The important change in the new board of officers is that Mr. Payne and Mr. Haskins exchange places.

⁂ The annual meeting of the Central New York Telephone and Telegraph Company was held recently. The following were elected directors: R. S. Williams, Lewis H. Lawrence, C. A. Nicholson, F. G. Wood, Utica; Henry L. Storke, Auburn; David B. Parker, Randolph; Martin A. Knapp, Syracuse. The following officers were elected: Robert S. Williams, president; Henry L. Storke, vice-president; F. G. Wood, secretary and treasurer; C. A. Nicholson, general manager.

⁂ The time will come, says an exchange, and it is not far distant, when the telephone will be used as extensively in the country as it is now in the large cities, and the farmer will call the village doctor, or the undertaker, or give an order to the butcher or the groceryman by the use of the most wonderful of modern inventions. Every farm house will be brought into communication with every other house in the neighborhood as well as with the nearest village; the isolation of country life in winter will be destroyed; there will be a wire from the home to the country schoolhouse, and neighbors will exchange news and gossip though the mid-winter blizzard rages outside in all its fury.

⁂ It is given out by a member of the Committee on Municipal Corporations of the Missouri Legislature that the Dempsey bill, fixing the maximum rate of telephone charges at $48 per year, which has been reported unfavorably by the committee, will be amended when it comes up for engrossment so that the charges shall be fixed at $75 per year. This will be done as a compromise between the telephone companies and the people. The committee believes that $48 is not enough to enable the telephone companies to keep up their business at its present high standard, and will urge the amendment establishing the rate at $75, believing that this will be satisfactory to the corporations and the public.

Telephone Wires Under Ground.

The Southern New England Telephone Company has come to the legislature, asking an amendment to its charter authorizing the placing of its wires in underground conduits in the streets, subject to the direction of the local authorities. It is true that the burying of wires is yet in its experimental stage, but some progress has been made, and as improved plans may be devised before the legislature meets two years hence, the company wishes to place itself in position to take advantage of them. It is contemplated to begin by burying the wires in the centers of the larger cities and towns, near the central stations, where the great number of wires coming in from various directions are objected to by adjoining property owners. We learn that it is the intention of the company, within a short time, to erect or purchase in New Haven, Hartford, Bridgeport and other cities, buildings for the sole use of the company, and facilities for construction and repair work.—*Hartford Times.*

Details of Incandescent Lighting.

The interesting illustrations relating to the detail work of electric lighting, present some of the more recent work of the Sawyer-Man Electric Company. The reader cannot fail to be appreciative of the innumerable little details that go to make up the perfect system of incandescent electric lighting. The REVIEW has on many occasions presented illustrations of the larger factors which go to make up the symmetrical whole of an electric light plant. In presenting this latter work of the very progressive Sawyer-Man Company, it is not necessary to describe each illustration in detail, as its name and purpose are indicated beneath each cut.

FIG. 4.—ATTACHING PLUG.

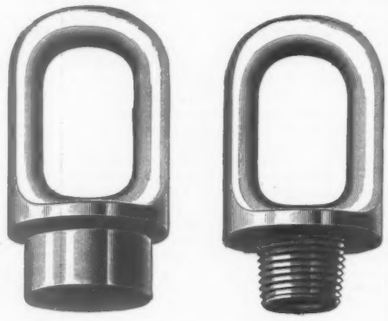


FIG. 5.—LAMP LOCKS.

FIG. 2.—KEY SOCKET.

FIG. 3.—KEYLESS SOCKET.

The great factory extending from 510 to 534 West 23d street is chiefly engaged in the manufacture of incandescent lamps, and in this respect the business of the Sawyer-Man Company has grown with wonderful rapidity the last 12 months.

—— Incandescent illumination is spreading in the smaller towns of Canada.

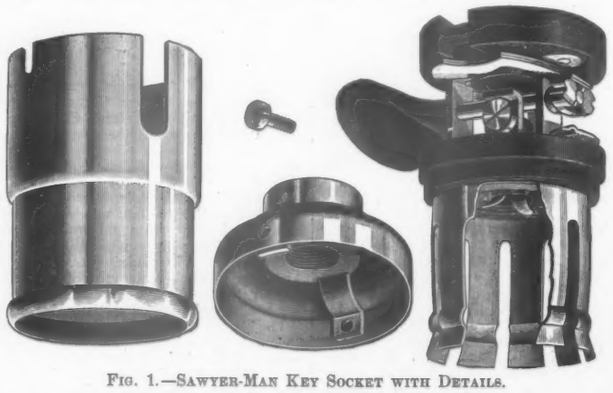


FIG. 1.—SAWYER-MAN KEY SOCKET WITH DETAILS.

Mr. Louis W. Dillon, of Attleboro, Mass., was at the Chicago Convention representing the Dillon Manufacturing Company, and showing the Dillon patent double pole switch, which was pronounced by those most competent to judge, an excellent switch and one that is bound to be well known in the future.

Municipal Management of Manufactures.

TO THE EDITOR OF ELECTRICAL REVIEW:

It has been a serious question among the wisest men in our country for a great number of years, whether the Federal government had power, in and by its Congress, to develop and maintain internal improvements throughout the States and Territories, and whether it would be assuming the proper and wise use of the surplus funds in the Treasury of the general government in thus developing rivers, inland streams, forests, railroads and all other methods of traffic and commerce. After years of discussion, it was demonstrated that it was a serious problem, whether the Federal government had any such power; and the unwisdom of its exercise was finally conceded by all parties, for the obvious reason, that it would be not only a perversion of the functions of such government, but would work a discrimination against the people of our various States. The larger States—owing to the representation in Congress, their social and political interests—might so far dominate and control the small States as to render such a distribution or use of public funds a series of continued contention, and possibly engender bitterness. More recently, this question has arisen from the proposition to use the surplus funds for educational purposes, throughout the States and Territories, but it has met with such little favor, and such pronounced opposition, as to have been almost wholly abandoned.

If not advisable, in theory and practice, for the general government—which exists for the purpose of promoting the morals and preserving the welfare of the nation at large—it certainly cannot be more advisable for the States, in their sphere, to undertake the same thing and if not wise with the State, it cannot be commendable in any political subdivision of the State which we now denominate "municipal corporations."

As a matter of fact and of serious experience, Pennsylvania has gone through this experiment. Years ago, when private capital was exceedingly limited, and individuals were unwilling to enter into combinations or corporations, for the purpose of developing the resources of the State, and carrying on internal ways, the State undertook, and did build a system of canals, and subsequently, of railroads, which were operated and controlled by the State, until the year 1857 or 1858. During all the time the State thus controlled these internal improvements, and it necessarily depended upon its appointees and authorized agents. As financial investments, they proved disastrous; their management was wholly and absolutely dependent upon the interest and the caprice of the political party in power. At every change in our State administration appointees were named for the control of these vast interests, whose simple qualification was that of usefulness to his, or their, political party.

After years of trial, the State finally sold out these interests to a private corporation, organized for the purpose of constructing a system of railroads through Pennsylvania, from Philadelphia to Pittsburgh. The result was that, under the management of that company, the canals and roads which had theretofore proved a source of annoyance and loss to the commonwealth, developed into one of the finest systems we have in our country to-day.

The experiment of the State, and its subsequent action, show, at least, that improvements, such as these, did not reach their highest point of efficiency, under State or political control. Responsibility, except of party, as cardinal to the question of fitness for control and management, was but rarely consulted.

Under private enterprise, and with private capital, a wholly new and far better condition of affairs developed. Not alone was this enterprise started by private capital vastly beneficial to the State of Pennsylvania, but it resulted in creating a system of railroads and methods of transportation throughout the entire length and breadth of the State, so that every branch of industry, commerce and trade, felt the beneficent effects of this individual enterprise. The people thus added to their comfort, to their wealth, and to their general prosperity; and, where properly managed, the stockholders, representing men, women and children, in all parts of the State, had a certain return upon their investment, and were assured that the money so subscribed would be faithfully and well managed.

No city in the State, which has undertaken any peculiar system looking to the lighting and heating, or any other public measure, has succeeded any better than the State. In almost every instance where private capital has been invested, and where the management of these private enterprises has been wholly controlled by the stockholders and directory, these cities have had more certain and successful advantages than could possibly arise under city control and management. There is not alone inefficiency and want of responsibility frequently arising where a great municipal corporation has the control of any such industry, but experience

has shown, most frequently, waste and extravagance, or such inefficient management as to amount to a serious taxation upon the people.

That in which the public at large has an interest, such as taxation, must necessarily be managed by a few public officers or agents, and not infrequently they, for the first time, through political favoritism, are called upon to manage affairs with which they are entire strangers. One experiment of this kind is apt to lead to another in which the credit of the city is virtually pledged for indemnification against loss. In almost every instance where a city in this country has become subscriber to, or endorser upon, the stock and obligations of private corporations, such as railroads, the result has been disastrous; leading, not infrequently, to almost total bankruptcy of such municipal corporation. The city of Pittsburgh, with which I am more familiar than any other, is still laboring under the burden of indebtedness arising from this unfortunate subscription to some of these corporations, whose management was under the control of persons outside of such city, and depreciated stocks and guaranteed bonds have been an incubus on that city, and upon many others.

If it be true that a city endorsing even for a private corporation, made up as some of these railroads are, suffers so greatly, it must be equally true that a city itself owning and controlling such interests would find itself in an equally embarrassed condition.

The result of this experience is to demonstrate the unwisdom of municipalities undertaking any other purpose, or engaging in any other business, than of its sole and pure charter duty. And so long as such city confines itself to looking simply to the public welfare in its internal arrangements, such as police, etc., it not only largely promotes the safety and welfare of the people, but ensures economy, and with it, lightened burden of taxation. To depart from this safe rule, so firmly based upon experience, and being to-day so widely discussed, is to invite serious danger, if not disaster. There is no other rule upon which a municipal government can more safely act, than by following its charter, and through such charter encouraging, in every legitimate way, the investment of capital by private individuals in all industries, through which come the happiness, the welfare, and the prosperity, of each and every community. If, when individuals invest their capital in such industries, there is a guarantee that their affairs will be carefully, prudently and economically managed, the city itself is safe, the corporation is benefitted; and, through individual benefit of the corporation, comes the benefit to the community at large.

It is doubtful whether to day, if we depended upon municipal corporations for our light, our heat, our rapid communication, our facilities for the supply of water, and all that enter into the prosperity and contentment of the community, they would ever have existed but for such individual enterprises.

Wisdom would seem to suggest, that every community, controlled by charter, ought to invite the citizens of such community, to invest their capital in all legitimate systems of industry; the true principle being, as we believe, to have such municipality guard itself against needless and arbitrary encroachment upon any of the rights of such private corporation. Community of interest can readily be secured, and with it there ought to be a co-extensive development of the private and quasi-public corporation.

Appreciating the general principles I have announced, all the States in this Union have sought, in all proper ways, to promote these industries, and in nearly every State, a system of law has been promulgated, for the incorporation, regulation, control, and encouragement of such corporations. The result is—in Pennsylvania at least—that almost any body of men may assume all the rights and duties, and be subject to all the restrictions, of these corporate laws, and feel absolute assurance, that, so long and so far as they comply with these statutes, they have immunity from loss, as they have from any unjust discrimination on the part of the State, or of any portion of the State, against them. The result is security of capital, and a clear, well-defined pathway, within which they may walk and develop their industries, and the assurance, that in proportion as such industry commends itself to the welfare of the people, they will have a return upon their investment, as well as the satisfaction of knowing that their enterprise is appreciated by their fellow-citizens. Without this legitimate aid, capital would remain stagnant, or if invested, would not infrequently be in mere bubbles, started for the purpose of filching from the unwary, and unsuspecting, their means, and thus, under cover of law, falling but little short of public robbers.

In addition to the general law found upon the statute books of most States of this Union, but especially in Pennsylvania, the law making power has discovered the necessity and advisability of providing for the incorporation of certain special branches of industry; and, in order to invite investment of capital, and to foster the same, have conferred on these corporations special privileges and immunities. Under what might be called this special legislation, some of the most important corporations of Pennsylvania have been brought into being, and are now operating to-day. In them are invested enormous sums of money; almost every branch of industry affecting the people has been touched and benefitted by them, so that the pecuniary advantage coming to the workman and to the manufacturer is almost beyond computation. Labor itself has been lightened, capital more generally diffused, homes have been secured, communities have been more firmly settled, and the comfort of the people of the State so largely developed as to be inestimable. Thus we have heat and light, and gas and water companies in almost every village in the State, and in order that the people might have brought to their own homes these vast advantages, the State has said to the capitalist investing his money, "If you will so do, we will give to you for a given period of time, and until your earnings shall amount to a certain percentage per annum, on your investment, absolute immunity from competition; that you shall have within the limits of the territory embraced by this village, or borough, or city, the exclusive right of supplying this commodity to the people of such place, until you are thoroughly reimbursed for the risk you take on the capital you have invested." Under this beneficial law, in almost every instance, men who have invested their capital have had a safe and reliable return upon the investment, whilst the people have had their happiness, comfort and prosperity so largely promoted that there does not live in the State to-day a man who has come in contact with such benefit, who would be willing to have the statute otherwise than it is. This, then, shows not alone the sagacity of the law making power, but presents a powerful argument on the part of the citizens, of the utility and desirability of such industries, and the encouragement of others to go and do likewise.

S. A. Duncan.

Pittsburgh, Pa., Feb. 15, 1889.

Fig. 7.—Water-Proof Socket. Sawyer-Man Electric Co.

Fig. 8.—Double Pole Switch, Uncovered.

Fig. 6.—High C. P. Lamp Socket. Sawyer-Man Electric Co.

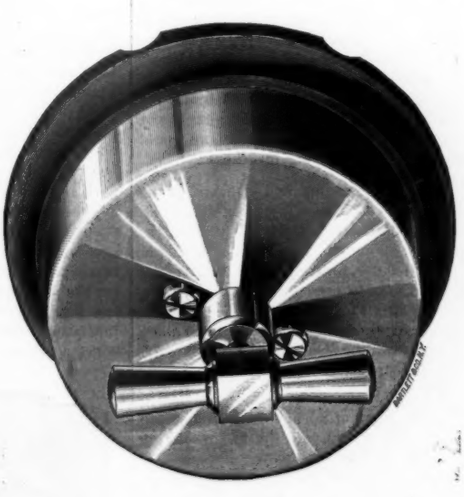


Fig. 9.—Double Pole Switch, Complete. (See next page.)

.... The bill of Senator Karraker, introduced in the Illinois Senate to regulate the charges of telegraph companies, fixes the following maximum rates of toll: For messages not exceeding ten words, exclusive of address and signature, transmitted a distance of 350 miles or more, 20 cents, and two cents for each additional word. For messages not exceeding 10 words, a distance of less than 350 miles, 15 cents, and one cent for each additional word, and for repeating, 10 cents. No charge is to be made for the delivery of a message within the limits of a city. Upon a first violation of the law the fine shall be not less than $200 nor more than $1,000, and for a second offense a fine of not less than $500 nor more than $2,000. Any person from whom an extortionate charge is made shall recover ten times the amount of damage sustained.

* * The Sioux City, Iowa, electric railway uses handsome iron poles, 25 feet in height.

* * An electric motor operating a drawbridge is successfully working in Bridgeport, Conn.

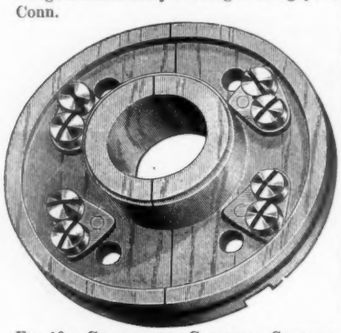


FIG. 10.—CHANDELIER CUT-OUT.—SAWYER-MAN ELECTRIC CO.

* * Electric railways are recommended by the Cleveland aldermen.

* * Newport, R. I., is favorably inclined to adopt electricity as a motive power on its street car lines.

* * The Youngstown, O., street railway has been sold to Cleveland capitalists. It will be made an electric road.

* * The Sprague Motor has become very popular in New Orleans, where a large number are in successful operation.

* * Cincinnati, Ohio, is to have an electric road running to Norwood, and will use either the Sprague or Thomson-Houston systems.

* * The National Electric Tramway Company has been formed at Victoria, B. C., with a capital stock of $250,000, with the object to construct and operate an electric street railway in that city.

* * An electric motor line from the Broadway M. E. church to the Rock Island depot, *via* First street and Graham avenue, and a cross-town line from the Rock Island depot to Manawa Lake, would open up a magnificent portion of Council Bluffs for residences, in addition to making rapid and easy transit to Fairmount Park, and would undoubtedly be a paying investment.

* * The Eckington and Soldiers' Home Railway, Washington, is asking an amendment to its charter, which will probably be granted, authorizing it to increase its capital stock $100,000, for the purpose of extending its road from its present city terminus, along various streets to the Treasury Department. Overhead wires will not be permitted along this part of the line which runs through crowded streets.

* * W. B. Ferguson, whose resignation from the superintendency of the Naumkeag Street Railway Company has been announced, is now occupying a responsible position with the Thomson-Houston Company of Lynn. He has charge of the construction and equipment for electric street railways introduced by the company, a place which his long experience in the business renders him eminently fitted to fill.

* * Now is an opportunity for electric power to be introduced into the to-be reconstructed town of Marblehead. One of the pleas given by manufacturers when the performance of electrical apparatus is shown them, is that their steam plant does them very well and it would not pay to make the change. Now that the steam plants are many of them destroyed, and the electrical plants can be paid for by the saving in coal, there seems to be no reason why they should not receive a fair test in the new factories.

* * Palmyra and Riverton want Camden's proposed electric railway extended to them.

* * The Thomson-Houston Electric Company has just been awarded a contract for the equipment of the electric railway from Rochester, N. Y., to Charlotte. The contract is to be completed by the first of June. There will be 16 cars, eight of which will be closed and eight open. The seats will face one way, with an aisle in the center. Each car will be equipped with two 15 horse power Thomson-Houston motors, and will be lighted by five electric lamps. The power station will be located near the Central Railroad crossing, and will be equipped with two 100 horse power engines, and two 80 horse power Thomson-Houston generators.

* * Prof. Henry Snyder, of Miami University, gave a lecture before the Cincinnati Electric Club last week on "Electrical Phenomena." The lecture, which was one of a free course, under the auspices of the Cincinnati Electrical Society, was well worth the hearing. Prof. Snyder, who occupies the chair of Physics and Chemistry at Miami, is a young man and an enthusiast in his favorite study. He began at fundamental principles, and explained each entertaining step in the advance of electrical knowledge. He showed the marvelous improvements in the application from the simple and almost useless Volta pile to the mighty dynamos which flood the streets with sun-light, and cause myriad wheels of industry to revolve. He showed how powerful, how wonderful this swift and powerful force is, the true nature of which is utterly unknown, and as yet but the speculation of the scientist. So clear was the language, so well chosen the illustrations, that those present were enabled to get a fair superficial knowledge of the subject.

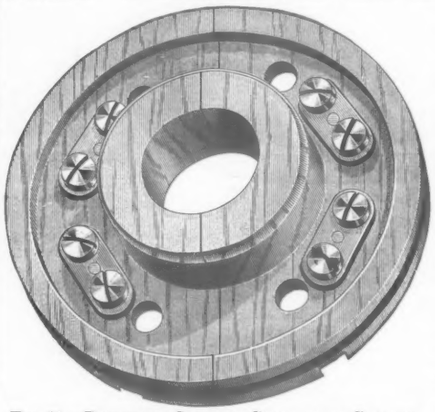


FIG. 11.—DIFFERENT STYLE OF CHANDELIER CUT-OUT.

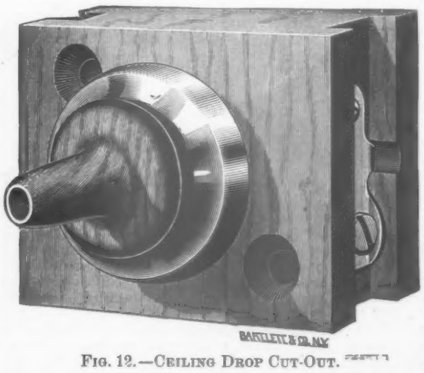


FIG. 12.—CEILING DROP CUT-OUT.

* * Springfield, Mass., thinks she is large enough to have a police electrical signal system.

"Disruptive Discharges in Lead Cables."

BY C. H. RUDD, BEFORE THE CHICAGO ELECTRIC LIGHT CONVENTION.

In coming before the Association at this time with the subject named, my principal object is to consider the experiments of Mr. E. G. Acheson. An account of these experiments appeared in the New York ELECTRICAL REVIEW July 7, 1888, and was enlarged upon by Mr. Acheson at your last meeting. The results of the investigations suggested two conclusions: First, That the static capacity of a cable is a transforming agency by which a passing current might develop a static charge of greater electro-motive force than the electro-motive force which produces said current; second, that a static charge will not pass an arc. These conclusions are radical and cannot fail to attract attention. If they are sound, they have a most important bearing upon cable service. By virtue of the first conclusion, we would be obliged to largely increase the value of cable insulation, or else put on high pressure protectors of a nature to carry a constant stream of sparks. And we would be obliged to ask: Why have we not had a much greater number of burn-outs than we have? By virtue of the second conclusion, the high pressure protectors, if used, would have to go into every section of cable cut off from other sections by lamps. I do not believe these conclusions to be sound, and expect to show that they are not. I question the first because it conflicts with the well known law that the electro-motive force of a static charge cannot exceed the electro-motive force of the charging source. This law is as well sustained in daily practice as in Ohm's law. If the results of an experiment point to the overthrow of a long established principle, the experiment itself will bear inspection.

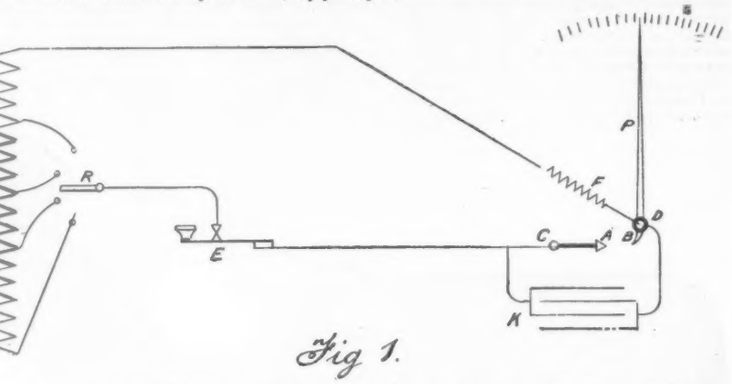


Fig 1.

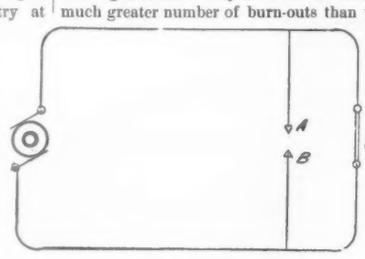


Fig 2.

Let us look at the experiment from which the first-named conclusion was drawn. Fig. 1 is an exact copy of Mr. Acheson's diagram. *H* is an alternating dynamo. *T* is a transformer, in which a portion of the wire is used for both primary and secondary. *R* is a switch to aid in obtaining different degrees of pressure. *E* is a switch with which to break the secondary circuit. *X* is a switch with which to break the primary circuit. *C* and *D* are posts supporting points *A* and *B*. The distance between points *A* and *B* is adjusted by means of pointer *P* and scales *S*. *R* is a piece of fusible wire for safety. *K* is a condenser. Now let us suppose condenser *K* to be disconnected for a moment. It was in that form that the first step was taken. We are told that by rupturing the circuit at *E*, sparks were obtained between *A*, *B* of various lengths, according to the position of switch *R*. This is plainly impossible. To open switch *E* is but another form of increasing the distance between *A*, *B*, and we know that such increase would not cause a spark at *A*, *B*. I do not deny that sparks were obtained in the experiment, but I do deny that sparking conditions were shown in this diagram. There are no explanations offered by which the sparking conditions can be understood, and explanations would be valueless in this case, for if the sparks occur in any roundabout way, the experiment becomes simply an electrical puzzle without bearing upon the subject under consideration. The investigator seems to assume that everybody will agree that ruptures of circuit and sparks are inseparable. This assumption is without support. When ruptures produce sparks, it is because accompanying conditions are favorable, for instance: If a closed circuit is relieving two points of electrical strain (see points *A*, *B*, Fig. 2), and said circuit should be ruptured, say, at *E*, points *A*, *B* would have to bear the strain, and a spark might pass between them. We do not find such tendencies to spark in the work shown. From the nature of the investigation, it is manifest that the first step in the experiment should have been to produce sparking conditions such that the sparks would depend on pressure only, after which the effect of adding condenser capacity could have been properly observed. Inasmuch, then, as the experiment shown to us lacks the vital element necessary to make it demonstrative, every deduction made from said experiment must fall to the ground. The subject under investigation by Mr. Acheson is treated of by Gordon under the head of secondary condensers. A secondary condenser (see Fig. 3), is said to add to the burning power of a spark. If Mr. Acheson had made a proper series of experiments in the laboratory, and had then desired to carry his work over into practical life, he would have first obtained a cable carrying heavy current, the cable having in it a spot so weak that the direct pressure was able to break through. In such a case he would have sparking points around which he might connect his secondary condenser, and observe

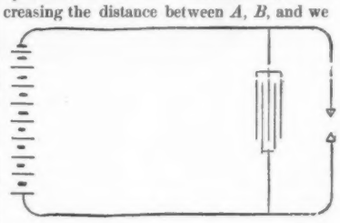


Fig 3.

its effect upon the burning power of the spark. He would, however, require some sort of electrical microscope with which to make his observations. That any ordinary method of noting the effect of a condenser upon the spark which I have described would be of no value, is manifest, when we consider that a condenser of one microfarad charged to a voltage of 2,500 would hold .0025 coulombs. A current of one ampere carried one coulomb per second. As it is coulombs which determine the destructive power of a spark, it is plain that when direct pressure begins to break through a weak spot in the cable, the addition to its destroying power, which it received from the condenser capacity of the cable, is extremely insignificant. To sum up my position concerning Mr. Acheson's first conclusion, I will say that the static charge in an ordinary cable is a negligible quantity when compared with the regular current flowing, and the electro-motive force of said charge cannot be greater than the electro-motive force of the current from which it was derived. Therefore, in considering the character and thickness of insulation, we have nothing to take account of but the primary pressure which bears upon the insulation. Mr. Acheson's second conclusion, viz: that a static charge will not pass an arc, virtually declares an arc circuit to exist as a number of sections in a sense insulated from each other, and in that connection the statement is made that each separate section comes under separate strain every time that the circuit is shut down. I think that I have already satisfied you that we may hold our old ideas concerning the electro-motive force of a static charge, therefore we need not fear that an imprisoned charge would do any more harm than the current did from which it came. If we charge an ordinary condenser from a battery, and the condenser does not break down, we do not apprehend that the condenser will break down when we disconnect the battery. There is in the minds of some people an idea that static electricity when it begins to move produces a current possessing different properties from current formed by other electricity under the same conditions. This idea is unsupported and need not be entertained seriously.

But let us see how Mr. Acheson proves that a static charge will not pass an arc. See Fig. 4, T is a transformer yielding 2,067 volts, S is a break switch, K is a condenser, A, B sparking points. C, D adjustable points so arranged as to be readily placed in contact, L a circuit of 20 incandescent lamps in series measuring perhaps 4,000 ohms all told. Mr. Acheson says that when contact was made between C, D no amount of rupturing circuit at S produced a heavy spark at A, B. From this the conclusion is drawn that the arc is an effectual barrier to the passage of static charge. Let us see. If we have an arc burning at C, D, it would expire simultaneously with the arc which would form at S when S is opened. Therefore the retardation spoken of by Mr. Acheson was due to the break at C, D, and not to the arc at all, the arc having expired before the observation under retardation was made. To sum up my position as regards the second conclusion it is evident that the arc affords free passage to ordinary currents, and we have nothing to indicate as yet that the arc makes distinction between the static charge in motion and other electricity in motion. It is also evident that the insulation of a cable does not undergo strain at shutting down due to static charge. Mr. Smith referred at the last meeting to some sparks observed when an arc circuit was shut down. These sparks may be readily attributed to magnetic discharge from the lamps.

I will now speak of an experiment in which I assisted last summer. The experiment is one which Mr. Sunny described before this Association in August, 1888. 1,000 feet of lead-covered cable was laid out upon an ordinary dry floor. This cable was connected as a loop into a working circuit. When first connected up, condenser C could be strongly charged by placing it in circuit between B and S (Fig. 5). At first sight it seemed that Mr. Acheson's position was confirmed. An attempt to repeat this experiment on the following day resulted in failure. Another attempt on the third day succeeded. I arrived at this stage of the proceedings. Upon examination, I found that different working circuits had been used each day. The leading idea in the experiment was that if a current would create a static charge of a nature unlike said current, the results should be obtainable from any working circuit. When I learned the conditions of the various experiments, I affirmed my belief that the results obtained were of the most commonplace nature, and requested that the steps in the experiment be repeated. This was done. We found that when we put the extra cable into a circuit entirely under cover, scarcely a sign of charge could be seen in condenser C; but upon plugging into a circuit exposed to the weather, a definite charge was obtained. We then returned to the covered circuit. Results were same as before, viz: no charge. We then put a ground at A. This gave us

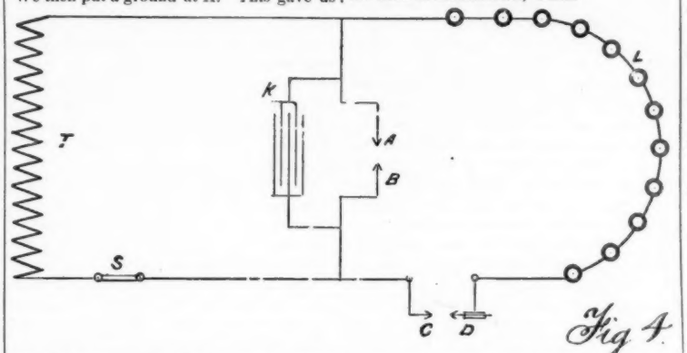


Fig 4

a strong charge. We then began to observe the polarity of charge, and found that we could reverse the polarity by putting the loop in at A, and the ground at B. This change removed all ideas that the results obtained were out of the ordinary, and let us square down upon the common principles of every day life. The shield S was a ground of some value, so we concluded that we had been trying to see if we could get a charge out of a working dynamo by connecting a condenser between A and the ground with a ground at B, and again, if we could change the polarity of the charge by putting the condenser between B and ground, with ground at A (Fig. 6). A rather simple experiment when stripped of its useless features.

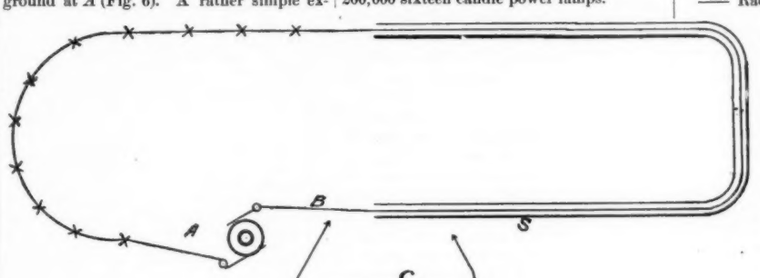


Fig 5

In conclusion, I will say that if disruptive discharges occur in properly insulated cables, we must look for the cause in those sources of high pressure which exist in nature. I do not believe that burn-outs can be ascribed to any one cause, but that each individual case has its own individual cause. In practice we must provide insulation strong enough to meet the daily strain, and suitable devices to prevent the accumulation of charge from outside sources of greater pressure than the insulation will bear. As yet we have no proof that high pressure protectors are required anywhere outside of station from which the wires start. Mr. Acheson says that the greater number of grounds or burn-outs occurring on arc light circuits are at the terminals of the lead or at the joints, and says that such a state of things would be naturally caused by the greater density of the static charge at these points. This statement strikes me as a singular carrying over of ideas obtained in laboratory work with purely static electricity and arbitrarily applying them to entirely different conditions. The natural static charge in a cable, due to the distribution of the working electro-motive force of the current in the cable, must necessarily be governed in its distribution by the force from which it originated. The shape of the conductor cannot act in the matter of this kind of static distribution, as the shape of an insulated conductor would act upon a purely static charge. This remark of mine about distribution may not be treated of by any of the men who write books, but I confidently appeal to my hearers for support. As regards burn-outs occurring at terminals and joints we know that great care is required to make these points equal to the rest of the cable in a matter of insulation. I do not see how it can be known that burn-outs at such places are not due to accident in construction or actual neglect on the part of the workmen.

ELECTRIC LIGHT NEWS

—— The Harlem bridge, New York, is now lighted by arc lights of the Harlem Company. The Habirshaw insulated wire was used.

—— European manufactories of electric lights are being visited for the purpose of finding a light to be used by the pearl fishers when at work under water.

—— The Schuyler Electric Co. have installed an incandescent plant of their own system in the Connecticut Industrial School for Girls at Middletown, Conn.

—— The Schuyler Electric Company have installed a 25-light arc plant in the large lumber works of W. B. Mershon and Company at East Saginaw, Mich.

—— At the election at Conshoken, Pa., next Tuesday the chief issue will be whether the electric light company shall continue to illuminate the streets of the borough.

—— The Edison system of electric lighting is said to have sufficient underground conductors in New York City to supply 200,000 sixteen candle power lamps.

—— The electric lighting company of Fostoria, Ohio, showed remarkable enterprise after their late fire, having new machines running before the ruins of their old station were cold.

—— The Electric Lighting Company, of Savannah, Ga., have just put in a Westinghouse incandescent plant of 75 lights at Hammond Hull & Co.'s new fertilizer works, on the Savannah River, west of the city.

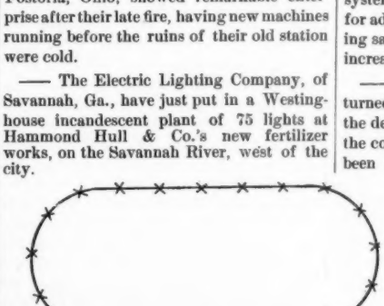


Fig 6

—— The Little Falls, Minn., Electric Light, Power and Heating Company, of Little Falls, incorporated with $50,000 capital stock, and indebtedness limited to $20,000. The incorporators are W. M. Fuller, D. Stoll and T. C. Gordon, of Little Falls, and J. A. Berkey and W. H. S. Wright, of St. Paul.

——South Pittsburgh, Tenn., wishes electric illumination.

—— Galena, Ill., has a new Ft. Wayne Jenney electric light plant.

—— Seneca Falls, N.Y., is being electrically lighted on trial.

—— Newark, N. J., has voted strongly in favor of electric lights.

—— An electric light plant is to be placed in Miller's shipyard at Chicago.

—— Wheeling, W. Va., intends to take up municipal electric lighting.

—— The Westinghouse Company propose to establish a plant at Batavia, N. J.

—— Capt. A. Kerr has been appointed manager of the electric light plant at Drillia, Kan.

—— The Montgomery (Ala.) Light Company have purchased the plant of the Brush Electric Light & Power Company.

—— The City Fathers of Augusta, Ga., have been petitioned by citzens for more electric lights.

—— Monmouth, Ill., has completed its first year with electric lights. The plant has been doubled.

—— The Thomson-Houston Company absorbed the local plant of the Schuyler Co., at Kingston, N. Y.

—— Racine, Wis., intends to join the large number of cities conducting their own electric light plants.

—— The Toronto Consumer's Gas Company has petitioned for the privilege of erecting electric light poles on the streets of the city.

—— At Wheeling, West Virginia, the Reymann Brewing Company will put electric lights in their brewery, and have contracted for machinery with capacity of 225 16-candle power lights. Edison system will be used.

—— The Mount Vernon, Ohio, Electric Light Company using the Schuyler system have received a contract from the city for additional arc lights. The system is giving satisfaction and the demand for lights is increasing very rapidly.

—— Last week the electric lights were turned on in the town of Lake, Ill., much to the delight of the law-abiding residents and the consternation of the footpads who have been afforded abundant opportunities for work by the darkened condition of the streets during the last few nights.

—— J. H. Andrews, representing the Van Depoele Electric Manufacturing Company, Chicago, has organized a stock company, and contracted to light the city of Munroe, La., for three years. They will put in arc and incandescent for public and private use. The plant is to be in operation this month.

—— A company composed of C. S. Squier, W. A. Pyle, John B. Prentiss, Kelly Brent and L. S. Jenkins, have applied to the City Council for a franchise to maintain and operate an electric light plant in Kansas City, Kas. The object of the company is to supply electricity suitable for domestic lighting, heating and mechanical purposes.

—— Harold L. Brintnall, of Saginaw, Mich., secretary-treasurer of the Swift Electric Light Company, left Saturday for Hayti in the hope that a change of climate may prove beneficial to his health, and to make a close inspection of the warlike situation there existing.

FUEL.

The Electric Light Men Consider This Vital Feature.

SEVERAL INTERESTING PAPERS READ AND DISCUSSED AT CHICAGO.

"FUEL OIL," BY S. S. LEONARD.

In presenting this second paper on fuel oil, I do so with some hesitancy, not that I have less faith in its use, but because I have not the data that I would like to have in bringing the subject before this association again.

During the past few months, I have endeavored to obtain what information I could upon this subject from those who have been using oil, and especially from any electric light companies. The general experience does not seem to be very favorable and I have been advised to have nothing to do with it, that the saving by its use over other fuels, if any, was more than counterbalanced by its injurious effect upon both boilers and furnaces, that the fire risk was greatly increased and it would be found very difficult to place insurance upon our plant. One gentleman wrote me they had just had a serious fire in their station which could be clearly traced to the use of oil, and then kindly offered to sell me their outfit of burners, pumps, &c., very cheap should I desire to find out for myself, what they already knew, that oil was a failure. Others found that the use of oil was injuring their boilers, by burning out the flues, they being compelled to put in new ones after a few months use; some reported that it was almost impossible to keep their furnaces in repair, as the intense heat seemed to melt the fire brick, necessitating the re-building in part of the furnace after a short use. This was somewhat expensive and amounted to more than was saved by the use of oil, so the oil was abandoned. As I read over these various experiences, it carried me back to the time when we were going through the same trouble; although we never injured our boilers, we did burn up a good many fire brick and were obliged to re-build our furnaces several times. Previous to our experimenting with oil, I had occasion to visit the East and saw for the first time natural gas in use. I was strongly impressed with its many advantages, and when fuel oil was first mentioned to me, I thought I saw in it a substitute for natural gas. We were assured it was not necessary to alter our furnaces any, only cover the grate bars with fire brick so the heat would not injure them, put in the burner, turn on the oil, light it, and let her go. It seemed so simple and could be done so easily and with so little expense, that I was delighted; but alas my expectations were not to be so easily realized. It was very evident fuel oil was not a success under the conditions with which we were using it. The oil was not all burned and run down into the ash pits where after a while it was set on fire and consumed; everything was dirty and the odor was far from agreeable. Notwithstanding all this, we still had some faith and kept at it and are now convinced that to make a success of burning oil for steam purposes, it is as essential to have the proper settings or furnaces as it is to have a boiler to make steam.

We have been using oil for about 18 months, and for the last six months exclusively under our seven boilers; these boilers are 14 feet by 60 inches, with 44 four-inch flues. During the first part of the night these boilers are all in use furnishing steam to four Reynolds-Corliss condensing engines, from which we are using about 1,100 horse-power. The steam pressure is easily maintained at any desired point, usually with us at 100 pounds. Our arrangement for the handling and storage of this oil I described in my former paper, and I only wish to add, that so far, it has worked admirably.

In speaking of the economy from the labor side, I made the statement that one man could attend to from seven to ten 150 horse-power boilers. This I am now positive of, and we have but one fireman during the night and one during the day, while when using coal, we had three men at night, and three or four during the day. It kept two men busy half a day wheeling out the ashes, and the other half were occupied in getting in the coal, and it was as much as one man could do to keep the flues clean. Now there are no ashes to cart out and no coal to cart in. Our flues are cleaned out once a week, and from the whole seven boilers there is not as much dirt as from one boiler with one night's run of coal. I am frequently asked if the burning of oil does not injure the boilers. A short time since, the inspector of the Hartford Steam Boiler Insurance Company, made a very thorough inspection of our boilers. This same inspector had examined them a number of times when we were using coal and was familiar with their condition previous to the introduction of oil; in reply to my question "Did you discover anything wrong?" he replied that he thought they were in better condition than when we were using coal. Our engineer has also examined them very carefully, and up to the present time has been unable to discover any evil effects from its use, so that from the length of time we have been using oil, and as no injury is apparent, I feel warranted in saying that the proper use of fuel oil will not injure a boiler. Improperly used, and by this I mean where the flame is allowed to strike the shell in any one spot continuously, it will soon damage a boiler and the harder it strikes the sooner the damage; but this is true of any fire whether it be coal, wood or gas, for if the fire be blown against the shell as an oil fire is blown, it is only a question of time and that not long when the effect will be very apparent. By the proper adjustment of the burner, this trouble can all be obviated and the flame carried beneath the boiler and not up against it. I have already mentioned the expense of keeping in repair the settings or furnace as experienced by some who have used oil; this should not be and is all wrong. We have furnaces that have been in use over a year and they are in as good condition as when first built and as far as I can see, will last for a long time yet. That oil is very much easier on them than coal, is what our experience teaches. In reference to the burner, I would say that its requirements are few but they are absolutely necessary to complete the success of using oil. It should be so made that it can be easily taken apart for cleaning when necessary; the oil should be all consumed that passes through it, whether the fire be a slow one or the burner pushed to its utmost capacity; it should not smoke but produce a clear, bright fire. When our seven boilers are going full blast, not a particle of smoke can be seen issuing from the stack. The fire should be as near the front boiler as possible and not half way back as I have seen it with some burners, for with the latter you are losing a large part of the capacity of your boiler, while the former heats the water the full length of the boiler at the same cost. Do you find it cheaper than coal, is a question very familiar to me. Yes, we do find it cheaper than coal in Minneapolis, but whether it would be cheaper than coal any where, I have my doubts, as it would depend altogether upon the cost and quality of the coal used. The best quality of Illinois lump coal costs us from $3.25 to $3.50 per ton while Eastern coals are worth from $4.50 to $5.50 per ton. I refer to bituminous coals. The oil costs at present 2½ cents a gallon, delivered in Minneapolis. In comparing tests made by us with oil and coal, we find that 2½ barrels or 104 gallons costing 2½ cents per gallon, $2.60, will evaporate as much water as one ton of coal that cost us $3.15, being a saving of about 21 per cent. in favor of the oil. With one pound of coal we evaporated 5.38 pounds of water; one ton of coal would therefore evaporate 10,760 pounds of water. With oil 14.8 pounds of water was evaporated per pound of oil. Oil weighs about seven pounds to the gallon; one gallon of oil would therefore evaporate 103.6 pounds of water. With oil at 2½ cents per gallon, it would take 126 gallons to cost the same as one ton of coal, viz: $3.15. 126 gallons of oil would evaporate 13,053 pounds of water, while one ton of coal evaporates 10,760 pounds of water, being a difference of 2,293 pounds in favor of the oil or a saving of 21 per cent. When I consented to write this paper, I fully expected to have tests made as to what we were actually doing now by indicating our engines, weighing the water and oil, etc., but circumstances have been such as to make that impossible. I have however calculated from the number of lamps burning and motors running the amount of power we were using at present, and by doing the same thing when using coal, I find that the percentage of increase in power used is considerably larger than the increase in cost of fuel, being about 15 per cent. Although I am fully aware that this way of figuring is not absolutely correct, still my figures thus obtained are so near the others mentioned that I feel they are not far out of the way and that we are actually saving in fuel alone at least 15 per cent. if not 20.

My attention has been called several times to the fact that the amount of water evaporated by us, viz: 5.38 pounds per pound of coal was very low; that is true, but the quality of the coal used was very low as well. I have made a few figures showing what would be required of coal at various prices to equal the cost of oil. With oil at two and a half cents per gallon, a ton of coal costing $3.50 must evaporate 7.25 pounds of water per pound of coal to equal the cost of oil, or coal costing $4.00 per ton must evaporate 8.28 pounds of water, and a coal costing $5.00 would have to evaporate 10.36 pounds of water to cost no more than oil. Our experience has demonstrated that it takes a very good coal to evaporate ten pounds of water per pound of coal, and that quality would be exceedingly cheap at $5.00 per ton with us.

Those of us who are interested in electric light plants know only too well how they are considered by insurance companies. I was once in the insurance business myself, and among the classifications of risks was one that was termed the moral risk; on this the rate was very high. And yet I can hardly believe that the underwriters look upon electric light plants as moral risks, not even though they use crude petroleum for fuel; still the rate is very high. We have had some difficulty in placing insurance on our plant, notwithstanding the fact that all of the insurance men who have inspected our system are agreed that they cannot see wherein the danger lies or that the risk is any greater than it was with coal. When we first introduced fuel oil, our insurance rate was raised from one and three-quarters to two and three-quarters per cent. At that time our arrangements for handling the oil were about as crude as the oil itself, and although we thought the rate exorbitant, we submitted, trusting that, should we finally adopt the oil for fuel, the insurance companies would restore the rate to about the old figures, but no, it made no difference whether the arrangement was good or bad the rate remained the same. Under certain conditions you are permitted to use oil without extra charge, but these conditions are almost prohibitory, especially if real estate is at all valuable in the vicinity of the plant, as for instance if you keep the oil in tanks 200 feet from your building above ground or 100 feet if underground, it can be used without extra cost I believe. Some companies allow the tanks to be as near as 50 feet if underground. I do not believe the danger lies entirely in the situation of the storage tanks; in fact, I think that has very little to do with it. There is no doubt in my mind but that the tanks should be underground and so arranged that they can be got at, and should a fire occur in the building and it becomes necessary to shut off the supply of oil, it could be done at the tanks as well as in the building. It is the opinion of many insurance men that our building could burn to the ground and the oil in our tanks not be affected in the least, and our tanks are about 25 feet from the building underground. I do not mean to say that no restriction should be put upon the use of fuel oil; there should be by all means—it will burn, and it makes a bad fire—but I do say that where properly put in, there is as little danger as from any other fuel used, and by properly, I not only mean the storage tanks, but the entire outfit, burners, piping, furnaces and all. What insurance companies ever thought of restricting the location of your coal sheds to 200 feet or even 50 feet from your buildings; and yet we had more trouble from coal than we have ever had from oil. Several times our coal sheds caught fire from spontaneous combustion, still, a little thing like that did not trouble the insurance companies any, and there was nothing said about raising rates. I am of the opinion that the insurance companies will soon discover that they are making a great mistake in condemning the use of oil on general principles.

"LIQUID FUEL," BY M. J. FRANCISCO.

Mr. President and Gentlemen of the National Electric Light Association:

I have been requested by your secretary to bring before this Association for discussion the subject of "Liquid Fuel," with facts *pro* and *con* regarding the benefits to be derived from its use.

Do not let the name mislead you. I do not refer to the liquid fuel that Dante saw, "which fed the fires in that abyss that Lucifer with Judas did engulf," but to the liquid fuel of the nineteenth century—petroleum oil.

At the present time we have no knowledge of any means of securing light without heat, and it only remains for us to employ the most economical fuel to produce the heat without useless waste.

It has been asserted that the question of dividends in electric lighting lies between the shovel and the dynamo, and the fraternity have been taxed to their utmost to provide a plan for dispensing with the shovel entirely and thus securing at least a part of the much coveted dividend.

Petroleum, it is claimed, will furnish the substitute. Query, will it? One pound of coal contains 12,000 heat units, while one pound of petroleum furnishes 20,000; another factor of vital importance is the power to vaporize water.

Engineers of experience who are familiar with the practical workings of coal, know that under the most favorable conditions not more than ten pounds of water can be vaporized per pound of coal, while petroleum shows a vaporization of 18 pounds of water for every pound of oil consumed, estimating in both experiments the feed water at 212 degrees Fahrenheit.

The heat in coal, transferable to water, is about 70 per cent., while the heat in petroleum, transferable to water, is about 80 per cent.

Therefore, with coal, 70 per cent. of 12,000 units gives 8,400, and for petroleum 80 per cent. of 20,000 is 16,000, a gain of 7,600 heat units in each pound.

This is on the basis of pure coal; but when we consider the waste (amounting in some cases to 25 per cent., and the master mechanic of one of the largest railroads in the country claims 55 per cent.) found in nearly all coal, such as sulphur, slate and earthy substances which are incombustible and retard, instead of generating heat, the difference in the per cent. obtained in actual practice is far greater than shown by the above comparison.

There is also in coal a large percentage of loss in transportation, and combustion in the heap, varying from 5 to 10 per cent.

From these facts, we can safely conclude that the heating capacity of oil is nearly twice that of coal as generally used.

On this basis the only question to be considered is the cost of power furnished by each at the dynamo. Three and one-half barrels, or 955 pounds of oil, equal 2,240 pounds of pure coal, therefore wit oil at $1 per barrel and coal $3.50 per ton, or oil at $1.50 per barrel and coal $4.50, the difference in cost would not be so marked if there were no other factors to be considered. When, however, we calculate the great saving in stoking, removing cinders and ashes, cleaning flues, and benefit to boilers, besides securing a steady heat, combined with the quickness and ease in starting and shutting down, we have an argument in favor of oil that stockholders who care for dividends can appreciate.

I have found upon investigation that oil can be delivered at my station for $1.05 per barrel, while soft coal costs $4.50 and hard $6 per ton.

On this basis, allowing five pounds of coal per hour, 12 hours per day, 1,000 horse-power requiring 803 tons per month, at $4.50, would cost $3,613.50. Two firemen to feed the same, $100; man cleaning flues and etc., $45; carting ashes and cinders, $100; making total cost for 30 days $3,858.50 with coal.

Same number of horse power, and same length of time, allowing three and one-half barrels for each ton of coal, would require 2,810 barrels of oil at $1.05. This would equal $2,950.50. Wages of one man in boiler room, $50, making total of cost of 1,000 horse power one month, with oil, $3,000.50.

Showing a saving of $858 per month, in above item, besides getting with oil a steady flow of steam, thereby producing that great consideration, regularity of speed. This is absolutely necessary in order to produce a perfect light, and will save, in addition, the wear and tear of the manager's nerves, as fluttering and jumping in unison with the spasmodic light, he stretches the third commandment to its utmost capacity.

If you are now burning coal, it will be necessary to equip your station with tanks, burners, cylinders, oil pumps, compressors, air receivers and additional apparatus, varying according to the number and size of boilers used.

During the past few months the following facts have been gleaned from an extensive correspondence on this subject with parties who are using liquid fuel.

The Boston and Albany Railroad Com-

pany, after a careful test made in their shops by a Lehigh University professor, say that the cost of fuel is about the same. Though they purchase their coal in large quantities at one time, and secure low rates, they prefer liquid fuel because it is clean and requires no fireman and gives a better supply of steam.

Day Cordage Company of Boston claim that with Cumberland Coal at $4.50 per ton, and liquid fuel at $1.15 per barrel, they save 15 cents per hundred horse power per hour, and the oil is preferable.

The Fairbanks Scale Company of Vermont report that they find it a great saving over coal while the boilers are heated evenly, the entire length, also that the insurance companies have not increased their rates.

T. P. Brown, manager of the Toledo, Columbus and Southern Railway, reports a saving of 33 per cent. in the price of coal, by using liquid fuel, also that two barrels of oil equal one ton of soft coal, while manufacturers on his road find it only costs one-half as much as coal for their stationary boilers.

The rolling mill works of this city (Chicago), use it under a battery of 14 boilers, and say that three and six-tenths barrels of oil does the work of one ton of coal. The cost of oil is less than coal, but the great saving is in labor for stoking, wheeling ashes and unloading coal. Formerly, when using coal, 25 men were required to operate this battery of boilers for 24 hours, now, with liquid fuel, four men accomplish the same work. The efficiency of the boilers is increased, and cost of repairs lessened, while oil flame is less severe upon the boilers.

Reference could be made, if necessary, to hundreds of persons who have had practical experience in burning oil, fully sustaining the facts given above, proving conclusively that liquid fuel is at least one-third cheaper than coal, and it is destined to be the fuel of the future.

I have thus far shown the benefits to be derived by using liquid fuel. It is, however, necessary to consider many points before deciding to adopt it, especially if your plant is in the centre of a large city with other property in close proximity. Managers of insurance companies are just cranky enough to believe that oil will burn, and unreasonable enough to object to your exposing and destroying property for which they have to pay, thus burying their dividends in the same pit you are trying to avoid.

Therefore they insist upon certain conditions before they consent to its use; among other things, demand that you store your oil 50 or 100 feet away from your station. If this should happen to place your oil tank adjacent to your neighbor's property, you will have the officers of the insurance companies whose policies cover his buildings, operating in a way that will drive grounds, short circuits and underground wires out of your minds for a month.

If necessary precautions are taken, and the apparatus is properly and securely arranged, there is no more danger with liquid fuel than coal. In fact it may be made safer, and insurance companies will permit its use without an extra charge for the privilege. Examine carefully, however, from an insurance standpoint, any apparatus offered you, before attempting to use it, or you may find that insurance is an expensive luxury, and operates fully as disastrously upon dividends as coal.

An iron tank will be required for storage of oil which should be located underground 100 feet from your station. This tank, if 16 feet in diameter and 8 feet in height will hold 250 barrels. If 20 feet in diameter and 14 feet in height, 600 barrels.

A pipe from this must pass underground to the car for unloading the oil by gravity if practicable, if not, by pumping. A second iron tank, holding enough oil for one day's use only, can be placed immediately outside the boiler house, with a safety pipe one and one-half inches in diameter, extending 10 feet into the air, to permit the escape of gas.

This tank must be connected with the large tank by an underground pipe for the purpose of forcing the oil into the smaller one, with another pipe for an overflow to carry the oil back or away in case the pump is neglected or left running. The small tank must be lower than the burners or furnace, so that, in case of accident, the oil will flow back to the tank.

In all pipes there must be stopcocks that will cut off communication between the burners and tank. The supply pipe at the boilers should be arranged with a valve not over one-half an inch in diame er, so that oil cannot under any circumstances be forced under the boilers faster than same is consumed by the burners, thus preventing an overflow from flooding the fire box. There must also be an escape pipe extending outside the building for cleaning the tubes.

In no case must the oil be allowed to flow from the tank to the burners by gravity, but must be supplied either by vacuum process, steam or compressed air. For this there are several plans. One is to force steam across the opening of a vertical pipe from the tank, and thus draw the oil up to the mouth of the furnace. Another is to use compressed air for atomizing the oil, and passing it to the burners. Others still use a retort and generate a gas. Unless the apparatus used is expressly arranged for starting the fire, oil must not be turned on until the burners are heated, for if it is flashes and explosions will follow.

If a station is furnished according to above conditions, the insurance companies will insure it without extra charge. If not, they will demand from 50 cents to $2 extra for every $100 insured, according to any deficiency that may exist, while if the burners are fed by gravity it is a prohibited risk.

Faraday has stated that the chemical action of a grain of water upon four grains of zinc can evolve electricity equal in quantity to that of a powerful thunderstorm. The Springfield (Ohio) Electric Light Company found by practical experiment, made last December, that a small quantity of petroleum, under certain conditions, could evolve a sufficient amount of flame to annihilate an electric light station without any thunderstorm.

They placed a storage tank holding 160 barrels in the basement of the main building, and another in the boiler house, containing the supply for daily use. From the last tank, the oil was carried to the fires by gravity, and here was the cause of the fire. Having received a fresh supply of oil, they filled the large tank under the building, then turned the oil into the small tank in the boiler room, and left the pump working while the men were busy in another part of the station. It overflowed the tank, and the oil escaped into the furnace, with the usual results following from gravity pressure, less oil, less building and less lights, with insurance managers running wild over the hazard of electric light buildings. Is it any wonder insurance companies object to assuming such hazards?

Holmes has said, "that science is a first rate piece of furniture for a man's upper chamber, if he has common sense on the ground floor," but if he has not got plenty of good common sense, the more science or more liquid fuel he has the worse for him. An electric light station can be made just as safe and secure as any mercantile risk, and insured at the same rate.

It behooves the members of this Association to investigate this subject, and correct the errors of the past if they do not wish all electric light plants placed upon the prohibited list. For why should that most powerful and magnificent system for the protection of mankind, known as insurance, and the youngest child of science, electric light, appear as antagonists upon the world's arena.

Now, gentlemen of the National Electric Light Association, as there is no State in the United States and few counties that have not a town called "Franklin," so in the no distant future there shall not be a city, village or hamlet where the current which leaped to earth at his command shall not be utilized in that most wonderful invention of modern science, the electric light. An invention which is daily fulfilling Goethe's last prophetic cry, "More light! more light!"

"ADVANTAGES OF OIL AS FUEL," BY C. N. RANSOM.

The use of oil as fuel for the purpose of producing steam is still, in a certain sense, an experiment, and yet it is no longer a question of whether it shall be used, but merely a question of the manner and method to be adopted. The general public opinion seems to be that oil must, to a great extent at least, take the place of coal as fuel. The advantages are so obvious that it is hard to find a man who does not believe that some method will be found by which a steady, smokeless, economical and easily controlled flame can be produced from oil by means of which boilers can be heated in a much more satisfactory way than is now done with coal. The great public is tired of coal, with its clinkers, smoke, dust and ashes, and the necessity of constant attention—not to say anything of the regular "corners," short weight and extortionate prices.

A large part of this feeling is due to the wonderful development of oil fields. Hitherto the petroleum found in Russia has been to a great extent neglected, yet the production is said to be so enormous that the daily output of one well at Baku exceeds the daily production of all the wells in Pennsylvania combined. Quite recently Nobel Bros. have taken hold of the business, and have erected extensive refineries, and are understood to be constructing pipe lines, which must result in cutting off all the export trade in oil to Europe, and in throwing back upon the home market all the oil which would otherwise be exported.

In connection with the subject of oil as a fuel in steam making, some points may be stated which are doubtless familiar to most of the members of this Association. The term "crude" is applied usually to both the Ohio and Pennsylvania products, but there is a vital distinction. The Pennsylvania "crude" is really worth more than the lower grades of refined oil produced from it, on account of the value of the paraffin, vaseline, lubricating oil, etc., produced from the residue after the lower grade of refined is taken off, mainly by simple distillation. Of course, when the higher grades of refined oil, such as the "astral," are produced, the additional processes required for purifying render the oil more expensive, but as a matter of fact the residue is really worth more than the distillation. The consequence of this fact is that no Pennsylvania crude oil is used as fuel so far as we can learn. The Ohio oil, however, stands on a different basis. No process has yet been discovered by which refined oil, fit to be used in lamps, can be produced from the Ohio crude. We are informed that large prices have been offered by the Standard Oil Company for the discovery of any process by which it can be done, and that this company has expended large sums of money in trying to do it, but has so far failed. The consequence of this has been an accumulation of over 12,000,000 of barrels of surplus stock of Ohio oil, for which the market is simply for fuel and so limited that it will not take the oil produced, to say nothing of the surplus. The fact that the residue after distillation is worth more than the distillation is especially true of this oil, and it is stated on high authority that the oil companies could easily afford to sell the distilled product at one cent a gallon and still make money from the residue. In their efforts to produce refined oil from the Ohio crude the Standard Company had accumulated several million barrels of distillate, which is not refined, and which can be used as fuel if a proper apparatus is devised, but for which there is no large market to day, and which cannot be sold for use in lamps or kerosene stoves. It is inevitable that these vast quantities of oil must be thrown upon the market, and that the price of oil must go down to a point far below the present one.

It gives one an impressive idea of the magnitude of the commerce of this country to reflect that probably nine-tenths of the vast quantities of oil sold in this country, and upon which such vast fortunes have been made, has been and still is used simply in kerosene lamps and stoves. The quantity of heat which can be developed by one pound of pure carbon is sufficient to boil 15 pounds of water from at least 212° F., if none of the heat was lost; and one pound of coal of fine quality, under similar conditions, will evaporate 14 pounds of water, producing 14,133 heat units. The total heat units which can be produced from one pound of petroleum are 27,531, and one pound of petroleum can be made to evaporate 285 pounds of water. These figures are taken from the work on steam boilers of Prof. G. B. N. Tower, formerly chief engineer of the United States Navy, and are believed to be reliable. In fact, other authorities seem to correspond.

The heat-producing value of petroleum, compared with pure carbon, is as 28 to 15; and, compared with a fine quality of coal, as 28 to 14, or 2 to 1; and 1,000 pounds of petroleum are equal to a ton of coal. As petroleum weighs 6½ pounds to the gallon, 154 gallons are equal in heat-producing power to a ton of the present coal. In practice, however, the heat-producing power of coal as used under boilers is very much less than the possible production stated. Referring again to Prof. Tower's work, we find that in actual careful tests of over 40 different articles of coal, the highest evaporation reached was 10.7, and the other results varied from 6 upward, showing a loss from the estimated possible result of from 30 per cent. to 60 per cent. We have been unable to learn of a single instance in which a higher evaporation than 10.7 has been reached with coal, and have learned of only a few special tests in which an evaporation of over 9 has been reached. Such results have been reached only with exceptionally good boilers with feed water heaters, and the best of modern appliances to utilize all the heat, avoid radiation, etc., and with the best of coal and the most careful handling. In regular use, however, even in improved horizontal tubular boilers with all improvements, the usual evaporation is from 7½ to 8½ pounds of water per pound of coal used, and in ordinary vertical tubular boilers the evaporation rarely exceeds 6 pounds of water to the pound of coal, and is oftener less than more. All these facts must be taken into account in considering the question of the possible value of petroleum as a fuel. Coal has been the universal fuel, and steam boilers are specially adapted and built for its use. Devices for producing perfect combustion of coal and for utilizing the heat derived from it have been patented by the thousand, and constant familiarity with its use in manifold ways has produced about as good a result with coal as we can well hope to reach, and this result summed up is, that whereas one pound of coal can be made in laboratory practice to evaporate 14 pounds of water—yet in common use in good horizontal boilers the average evaporation is but 8, showing a loss of 43 per cent.—and in common use in upright tubular boilers the average evaporation is only 6, showing a loas of 60 per cent.

Reverting to our former figures, it is evident that if one pound of oil is equal to two pounds of coal—under laboratory tests where one pound of coal evaporates 15 pounds of water—and 154 gallons of oil equal one ton of coal, then when there is a loss of 43 per cent. on the heat-producing power of coal as in horizontal tubular boilers—88 gallons of oil (if there was no loss in using it) are equal to a ton of coal, and in tubular upright boilers where there is a loss of 60 per cent. in using coal—62 gallons of oil (if there was no loss in using it) are equal to one ton of coal.

It is evident that if such results as these could be accomplished, and other objections overcome, oil would be in universal use.

Whether such results can be reached or not is difficult to predict. Inventions in the line of apparatus for burning oil to produce steam are comparatively recent. Nearly all of the inventions are in the line of atomizing or injecting burners, and there are probably few, if any, horizontal tubular boilers in which oil is used as a fuel with any but an atomizer or injector. Burners of that description and of one peculiar form or another have been in use for several years. There is probably but little to choose between the different varieties.

The Cincinnati Spring Company wrote last June that they had probably used upward of 10,000 barrels of crude petroleum with atomizing burners and preferred it to coal, and that they had tried all kinds of injector burners, but made one out of their own that suits them better. The Michigan Bolt and Nut Works, of Detroit, wrote on May 14th: "We tried the 'Askins,' the 'Chicago Edwards,' and a simply constructed burner of our own, using gas pipe, and we liked ours as well as any." Studebaker Brothers, manufacturers, of South Bend, Ind., wrote on May 14th: "We have not yet determined what make of burners is the best. We have had about as good results with one we made in our own shops as with any." Of this class of burners there are any variety in use with more or less success. In my brickmaking and certain classes of furnaces they seem to be regarded as being very satisfactory.

There have been, however, some serious objection to their use in boilers. In the first place, it is always necessary to make a fire in some other way first, in order to produce a sufficient pressure of steam to start the burners, and it seems generally the case that they will not work on less than a 30-pound pressure. One of the consequences is that if the steam happens to run down it can only be raised again by shutting off the oil and making a fire of coal and wood. They are therefore of no use except where a long-continued high pressure and a constant fire are maintained. Another difficulty with that class of burners is that their practical use seems to be limited to horizontal tubular boilers where the flame can be allowed to shoot through a long distance without coming in contact with the iron, the flame being thrown generally upon or against fire brick.

Messrs. Keasley & Mattison, the celebrated chemists of Amblar, Pa., say: "The furnace must be lined with fire brick, and satisfactory results can then only be obtained after the fire brick reaches a white heat. The fact seems to be that in the atomizing process the oil is sprayed in small globules, and if these globules strike a cool surface or one not excessively hot before they are entirely consumed, the result is imperfect combustion and a large amount of smoke. This peculiarity of injector burners seems to render their use impossible in locomotives or vertical tubular boilers. In fact, I have seen letters from at least 70 different leading firms and well known companies located in almost every part of this country, stating, in almost every instance, that, while they knew of injector burners, etc., they never knew or heard of an apparatus for burning oil under boilers which did not require the use of steam or compressed air, nor did they know nor had they heard of any apparatus whatever for burning oil used successfully under vertical tubular boilers. I have also seen a letter from the manager of the fuel oil department of the Standard Oil Company, stating that he knew of only one burner which could be used under vertical tubular boilers. It is also a fact, I believe, that no burner has yet been brought into general use under house heating furnaces. I believe it is now generally conceded that the use of atomizing or injector burners cannot be extended to embrace either vertical tubular boilers or boilers of the locomotive or portable type or even horizontal tubulars below 50 horse power. In fact, the system of atomizing does not appear scientific. It seems upon its face a crude and clumsy way of producing combustion. I believe, however, that the members of this Association recognize few impossibilities, and certainly are quite convinced that a device can be made by which oil can be burned and which can be easily and perhaps automatically controlled; and it would seem that such an apparatus would go a long way toward solving the problem of isolated lighting. For such a device we must, I think, turn to the system of converting the oil into gas first and then burning it. It seems to me such a system is in accord with the principles of science, and that in no other way can the best results be obtained from the

oil. Of this class of devices the greater number have consisted of coils of pipe maintained at a high heat in which the oil is vaporized and from which the vapor or gas issues in jets and is burned. These coils of pipe, however, I think, without exception, have proved failures, because of the coking or accumulation of sediment. Attempts have also been made to burn oil and water together, which have so far proved unsuccessful, chiefly because of the great difficulty in adjustment and because they have been too complicated. Another defect has been that the vapor issuing from the tubes produced a smoky flame of comparatively small heating power. Still another difficulty has existed in the fact that if by carelessness the valves were opened too far, the oil would overflow.

Some time since my attention was called to an oil burner of the vaporizing type which was submitted to several eminent scientists and to a number of practical men, and was approved by them. In that burner the oil was first turned into gas, and then gas issuing in small jets was mixed with air before combustion upon the general principle of the the Bunsen burner. The result produced was a steady flame, entirely smokeless, and in some parts of the flame was a most intense blue. The flame produced was regular and of large volume. The cylinder was large and capable of producing more gas from the oil than could be discharged under light pressure through the jet holes, and the tank was elevated so as to give a gravity pressure of about four or five pounds to the square inch. The result was that the gas stood in the cylinder at an even pressure exactly equal to the gravity pressure maintaining the steadiness of the flame; and no oil would flow into the generator except as the pressure was lessened by the consumption of gas, even when the fuel valve was opened wide.

Whether that particular device was or is the best or not, it seems to me that some device constructed upon that line must produce the best results attainable, viz: the oil should be turned into gas and the gas burned after admixture with air, upon the same principle as ordinary gas is burned in stoves. Some of the advantages which a successful apparatus for burning oil would have are easily understood and are: Steady flame, perfect control—slight draft required — the power to increase or decrease the flame at will by the simple turning of a valve—the power to maintain steam at a steady pressure—the slight attention required — the power to instantly extinguish the fire without waste—the uniform heat—no reduction of fire or pressure when replenishing the fire—cleanliness—safety—economy in labor—no dust cinders or ashes - less room required to store the fuel, and only one-third the weight.

With these advantages to be derived from the use of oil as fuel, it seems only reasonable to expect that within the near future some successful apparatus will be brought into general use for manufacturing and house-heating purposes.

FIG. 1.—NORTH AVENUE AND ARLINGTON DIVISION OF WEST END ELECTRIC RY, BOSTON, MASS.—(see page 17.)

THE DISCUSSION.

The Chairman: Gentlemen, there are several papers on petroleum lighting and fuel now before you for discussion.

Mr. Leonard, of Minneapolis: I do not suppose there is any member of this Association more interested in this subject than I am. We are pioneer users in the northwest of oil, and I have listened with a great deal of interest to these papers, that of Mr. Francisco and that of Col. Ransom. While I do not exactly agree with some of the statements made in them, especially on the question of insurance, at the same time there are some excellent points. In the first place, the question of insurance is the only bugbear with us at present that we have to contend with. The other troubles we think we have overcome. As I stated, to comply with the requirements of the insurance companies would make the use of oil almost prohibitory. Mr. Francisco states that by the introduction of air pump, for creating a vacuum, making somewhat of a complicated apparatus, and by the storage of your tanks 50 feet away from your building, you can use it. I think it is a great mistake. I believe that oil can be introduced and used under a gravity pressure with as much safety, if not more so, than you can by pumping it. He quotes the Springfield, O., fire as being an example, to a certain extent, of feeding by gravity. I had the pleasure of a short conversation with the manager of that station not long since, and I was especially interested in that, as just before leaving home the insurance agent informed me that a policy of one of his companies was cancelled. I asked him why: "Well, they will not insure because you feed by gravity." I said, "All right, I don't care." In my conversation with the manager of that company, I asked him what his arrangement was. He stated that his storage tank was underground, and also under the building—in the building, practically; that his supply tank was above ground, holding, I think, 24 barrels, or thereabouts; that tank was also in the building. An oil pump was used to pump the oil from his tank cars into his storage tank, and also into his supply tank. The supply tank was an upright tank, and on the top of it was a manhole which was left open at times. The pumping of this oil stirred it up more or less, and created a great deal of gas. The gas escaped from this manhole, and the building was more or less filled with it. The oil, as Mr. Francisco said, overflowed and came out through this manhole. Gravity had nothing special to do with it, that is as to being used for feeding his boilers. It overflowed and ran down the tank and ran over the floor to a lighted lantern that was left by one of the employés of the company; naturally it caught fire, and the result was that we had a bad fire, and abandoned the use of oil as being impracticable for steam making purposes; not entirely for that alone, though, as he informed me that he also received considerable damage to his boilers. The only thing that surprised me was that he had not burned up long ago. He had a regular firetrap there, and it was only a question of time when the accident that happened was bound to come. Now I claim that the use of that oil should not be condemned generally by insurance companies because one man has it put in by a very poor arrangement. We have studied that very carefully, and I believe, and I know, if the opinion of insurance men can be counted as good for anything, that our entire building could be burned to the ground and not the least particle of damage be done to our oil apparatus and our oil storage tank. We have a capacity of about 26,000 gallons in two tanks; they are eight feet in diameter and thirty feet long, placed underground, as I stated, about twenty-five feet from our building, walled up on the side, imbedded in masonry and arched over on the top with brick. We have a space between the two tanks about six feet, giving plenty of room for a man to go down there. We have valves at the opening of the tanks where the oil is admitted to the supply pipe and can be cut off there; at the entrance to the building there is another valve where it can be cut off; as it flows along the supply pipes there is another valve before it gets into the building, making four valves before the oil reaches the burner; so that I still claim that the condemnation by insurance companies of the use of oil on general principles, because this man or that man has a poor arrangement and has burned up a station by the use of it, is all wrong.

Mr. Lockwood: I have listened to the papers upon this subject and to the discussion with a great deal of interest. The company which I represent in Detroit have been using crude oil since the first of July last, and we have used it continuously. I think when Mr. Francisco states in his papers that the gravity system was by far the most dangerous and would not be allowed, he evidently believed what he said; but I think he made a great mistake. I think the question to be determined is which is the safest; that is, the question of which would allow the the most oil to escape through a break or a leak in a pipe in a given time. In running by the gravity system our small tank, which brings the oil to the burners under the boilers direct by gravity, has the capacity of about one barrel per hour; and we have two pumps, so we have always on hand oil enough to run the heaviest part of the day which would run about one barrel per hour. In the light part of the day that same amount of oil would last three or four hours. Now, one hour in the heavy part of the day is enough to repair your pumps if you have an extra pump on hand; and running as we are, we have never had the slightest trouble, and I know where a leak occurred in one of our pipes, there would be a far less amount of oil worked out through that leak in a given time than if we used a pressure as the pressure system used, I believe, would be ten pounds to the square inch at least.

Now the manager of one of the largest insurance companies came to our plant and examined it thoroughly. That subject came up. He was under the impression that the pressure system was the only safe one, but he finally changed his mind and said that he would recommend in the future that the gravity system be employed, and with a small tank which furnished the oil be limited to one barrel per boiler per hour and that would give capacity enough.

Our plant is different in one respect from any that has been spoken of, inasmuch that the large tank, although under the ground, is within one foot of our building; and we are right in the heart of the city of Detroit. And still as close as we are to other buildings with the capacity that we have there, the company only charges us 20 cents additional rate of insurance, and still we use the gravity system. We have been using that since July last, and have had no trouble, and even with that small capacity to feed the boilers, we can always get our extra pump to use in case one pump gives out, so that we will not be out of oil. Mr. Francisco spoke of a case where the tank had overflowed by gravity and caused a fire. If that had been arranged as we have ours arranged in Detroit, that would have been an impossibility. We feed from the large tank under the ground to the upper one by means of a pump, and the pipe is only a one-inch pipe. We have from the upper tank returning to the lower a three-inch overflow pipe, and the three-inch overflow pipe will carry more oil than the maximum capacity of the pumps. Second, if the oil is allowed to raise too high, it can do nothing more than simply to return to the tank from which it is pumped.

We also have connected with it one other safeguard which I think is a necessity; that is, the pipe feeding the oil from the small tank to the burner is connected at the level of our floor with the overflow pipe returning to the large tank with a cock opening valve, so in the event of fire if this valve is opened in less than two minutes every bit of oil in the building within the small pipes will be thrown back to the large tanks.

And the insurance inspectors have approved that system, and only charge us 20 cents additional to the old rate. Our oil costs us 60 cents per barrel delivered in our tanks. The coal we used before was soft slack, and it cost, during the different periods of the year, from $1.90 to $2.10 per ton. I have found upon close investigation and close analysis to be about the same expense for oil as the coal was, but I find it to be a saving in the way of convenience, as we have had two or three cases in the last six months where it was of the greatest necessity to the employés to suddenly stop; with the oil we have been able to shut off in an instant, and to resume again without any loss of time.

Now, I would like to ask one question. Each of the gentlemen have spoken of the evaporative quality of oil as compared with coal, but they have left out one question. In coal, the total amount of water evaporated is used for effective work; in oil, part of it is used in the pressure. I would like to ask if any of these gentlemen have any definite information as to how much this water evaporated by the oil is used in the pressure.

Mr. Francisco: I have been inspector-general, inspector and general agent and adjuster of insurance companies for 25 years. That was my business until I took up the electric light business; in fact, I am in it now. I think I can safely speak in regard to the insurance of goods. I have consulted nearly every one of the prominet companies of the country in regard to this very question and in regard to these various points that I have developed in my paper. The insurance companies' managers have told me that if the electric light folks would adopt the plan I have proposed, they would insure them; but if they did not, they should charge them as I have specified. Now, I am president myself of the Underwriters' Association of our State, Vermont, and therefore I think I know what I am speaking about when I talk about insurance. In regard to the Springfield matter, I wrote to the manager of the Springfield paper about insurance. I wanted to know what the cause of that fire was, and especially as I purposed to use this crude oil in my own station. He did not answer my letters. I then wrote to a prominent man in Springfield, and anybody who knows the man will guarantee his authority as good. He went there and made a personal examination of the situation, and got all the facts in regard to the fire, and it was just as I stated in this communication of mine; he puts it on paper, and signs his name to it and sends it to me, so my authority is clear, and I can rely on his statement. Now, Mr. Leonard's theory about these valves and all that is all right. There is no objection to that. But the point comes just here; there are always a lot of fools around electric light stations the same as everywhere else so far as fire is concerned, and your station may have 40 valves, but what good would it do to men situated in the other part of the building? What good would his valves do if he had 50 of them as long as there was no one to take charge of them? In the case in Winstead, Conn., where they used petroleum oil, the station burned up awhile ago. The insurance was paid. Insurance companies get their information by sad experience, and they know what every one of these things come to. When they draw their check in 5, 10 and 30 days, as they have time and time again, they know just exactly what it costs to put petroleum fuel in that place. They were burning oil at Winsted, and they fixed everything up in first-class shape; they had steam pressure where they forced the oil from the vertical pipe; then they had an escape pipe for blowing out the sediment that always gathers in pipes, and a drip valve or drip pipe running down from that to take out the sediment. In that case they had forty pounds of steam pressure on that pipe that was forcing this oil on these burners. What does that man do? He unscrews that cap to let out that sediment (there was forty pounds pressure upon it), and the result was he had a two inch stream of oil pouring into it, with all that force, and anybody can tell what would be the result. That case was reported to the papers that it was an explosion of gas. After the loss was settled I went down there to investigate that matter, and find out what kind of gas it was, and it was finally explained to me. There is an illustration of that which you have to guard against in this business, and you have to fix it so it is impossible to have those things happen, and, in

our experience as insurance men, we are aware of such blunders, and we are looking out to see that they do not occur again. Now, my theory was to have that blowpipe pass out of the building, so in case you have such a man as that, and he wants to experiment, let him explode it out in the air. Although I am in the insurance business, it is very difficult for me to get insurance enough. They will not write insurance on my own station, and I have not been able to get enough insurance, notwithstanding the fact I was right in the business. Now, there are millions of dollars invested in electric light plants. It is all right as long as you get something back, but if a fire comes, or your station is wiped out, then where is your stockholders' money? If you have no insurance, where are you? If you have, of course you are all right. Now, the question is, if the insurance companies go back on the electric companies and won't write insurance on their plants, what inducement or what argument are you going to produce to get capitalists to put money into electric light stations? I think these objections can be obviated in the manner I have proposed. Just before I left home, I offered the risk to the agent of one of the biggest companies in the country, on my own station, which he declined, saying he would not write it at any price. "Well," he said, "to be candid with you, we don't know anything about it; therefore, we take the safe side and refuse." I took him through the station and explained the whole *modus operandi* to him, and after he got through then I showed him this paper. He said: "I want you to send a copy of that paper to our company, and we will investigate this matter, and if you will send it to the Insurance Exchange, we will investigate it; and if the electric light folks wish to meet us, we will meet them at any time, and have a committee appointed to investigate this whole matter." Now, there is the basis of what you want to do. My suggestion is that this Association appoint a committee to meet a committee of the insurance companies to investigate this matter and put it upon the proper basis, and enlighten them upon this subject of electric plants. I claim that they are just as safe as mercantile risks. I have examined that subject, as I said, from the insurance company's standpoint, and I ought to know something about the insurance part of it even if I do not know anything about the electric part.

Mr. Lockwood: I stated a few moments since that our insurance in Detroit, under the conditions that our plant has been erected, was only increased 20 cents per $1,000, and what I now add is this: that when we put in our crude oil plant our insurance was very nearly expired. It did expire about three months since, and I have since renewed it, and renewed it at the same rate, and the result is that in the insurance, with the exception of paying at the rate of 20 cents more for $1,000, I have no trouble now in placing our insurance as well and easily as I did before. In regard to the danger of using the gravity system, I think, as Mr. Francisco says, that it is simply a question of putting it where it is less liable to do damage by means of ignorant handling; and that resolves itself down into one question. In the event of a break occurring in the pipe, the valve being constantly open, or open by mistake, that allows the oil to escape.

—— The Thomson-Houston Company are putting in the following new plants: Rockland, Me., 30 arc; Atlanta, Ga., 1,000 alt.; Troy, O., 600 alt.; Mobile, Ala., 500 alt.; Macon, Ga., 500 alt.; Woburn, Mass., 50 arc; P. J. Noyes, Lancaster, N. H., 50 inc.; T. J. Stewart, Bangor, Me., 50 inc.; H. W. Smith, Bangor, Me., 50 inc.; Alliance, O., 25 inc.; Faribault, Minn., 1,500 alt.; Astoria, Ore., 100 arc; Ashville, Tenn., 150 arc, 600 alt.; Grand Rapids, Mich., 200 arc; Passadena, Cal., 1,200 alt.; Wabasha, Minn., 300 alt.; Austin, Minn., 500 alt.; Milwaukee, Wis., 50 alt.; Wichita, Kan., 1,300 alt.; Reno, Nev., 600 alt.; Mason, Mich., 30 arc; Poplin, Mo., 50 arc; Burlington, Kan., 30 arc; Richmond, Mo., 35 arc.

The West End Electric Railway.

The equipment of the Cambridge Division of the West End Street Railway between Bowdoin Square, Boston, and Harvard Square, Cambridge, is now completed by the Thomson-Houston Company, and the cars are operating on schedule time. Work on this line was commenced November 20th. The construction presented some electrical problems of no slight difficulty, but they have been successfully solved. The most important of these was the drawbridge, which necessitated some special construction in order that the opening of the draw should have no effect upon the operation of the cars on either side of it. The automatic switch which is used there, is shown in the accompanying cut. The main circuit runs under the draw from side to side, through a special cable, which is joined to the overhead wires on each side, thus making the circuit complete. Besides this an auxilliary cable is used, supplying the current on the short stretch of overhead wire on the draw, which is independent of the shore wires. This cable is brought up to the center pier on which the drawbridge revolves, and is connected to one part of the automatic switch which is stationary on the pier. On the revolving part of the bridge is suspended the other half of the switch, which is in turn connected to the short strip of overhead wires on the draw itself. When the drawbridge swings in the switch is closed, and the current can reach the overhead wires and be applied to the cars which are crossing. When the draw is opened the connection at the switch is broken. This connection is entirely independent of the main cable which runs underneath the draw from side to side. The rails on the drawbridge are connected the same as those on the street, by a copper wire, and four poles, one at each corner to hold the conductors in position. The overhead construction at each end of the drawbridge, and upon the draw adjacent to these ends, is of special design. A long piece of iron pipe is used to secure rigidity, and to which the curved ears are fastened, and to each end of the pipe, as shown in the cut, are placed frogs, so that when the draw is closed these two frogs come together, thus rendering it impossible for the trolley to jump the wire in passing from the conductor on the main bridge to that on the drawbridge. The overhead conductor is reinforced by feeder wires which are run out from the power station and connected to it in proper places, and serve to maintain a constant potential at all points on the line, or to prevent a break in any place interfering in any way with the operation of the cars.

The work, as laid out by the West End Railway Company for the Thomson-Houston Company to accomplish with their electric cars, was to handle the entire North avenue and Arlington business as it centered at Harvard Square, between that place and Bowdoin Square, Boston. The business on this line is exceptionally heavy, in fact one of the heaviest in Cambridge. The first car for Boston leaves Harvard Square at 6.10 A. M., and thereafter every 10 minutes until 6.10 in the evening; and from that time until 11.20 fifteen minute intervals are made. This means a total of 93 round trips per day per car. Beginning with the first trip on Saturday morning, February 17th, but seven trips were lost. In view of the fact that the traffic was very heavy indeed, that it rained heavily all the afternoon, that the drivers were unfamiliar with the cars, this record is certainly a remarkable one. On Sunday, the regulation 72 trips were made without a miss. Monday, Tuesday and Wednesday, the regulation week day 93 round trips were made without a miss. By the round trip of course it is understood that the electric car towed a North avenue car. On some trips 200 passengers are carried. The total number of passengers carried per day is about 7,000. There was no little surprise and admiration manifested at the manner in which the car took its load of more than 150 passengers up the 5½ per cent. grade on Cambridge street, and the ease with which the car was stopped and started upon it. Considering the fact that Cambridge street is one of the most crowded, thoroughfares in the city of Boston, being the main street over which all the Cambridge business from Boston travels, it is astonishing that such a record like the above could be made; and it reflects the greatest of credit upon the engineering skill and perfect workings of the machinery of the Thomson-Houston Company. Taking the performance for one day of these motor cars, as before stated, they made 93 round trips. On account of delays through the steam railroad crossing, or heavy teams, or the drawbridge being opened, on some days it was necessary to put out 8 or 9 cars at a time. On Monday 7 cars easily handled the entire business, making a total mileage of 604 miles; this is per electric car, 86 miles a day. If to this is added the same mileage of the tow car, a total car mileage was made of 172 miles to the agency of one electric motor car. Figuring on the usual mileage basis that a horse can make, it amounts to the fact that one electric car did the work of 32 horses. Mr. Hapgood, the superintendent of the Cambridge Division of the West End Road, stated that he would not want to agree to maintain, as a regular thing, the work done by these 7 electric cars with any less than 212 horses. Such figures as these, and such a record on a road of this description, should certainly convince street railway men of the possibilities of the Thomson-Houston system.

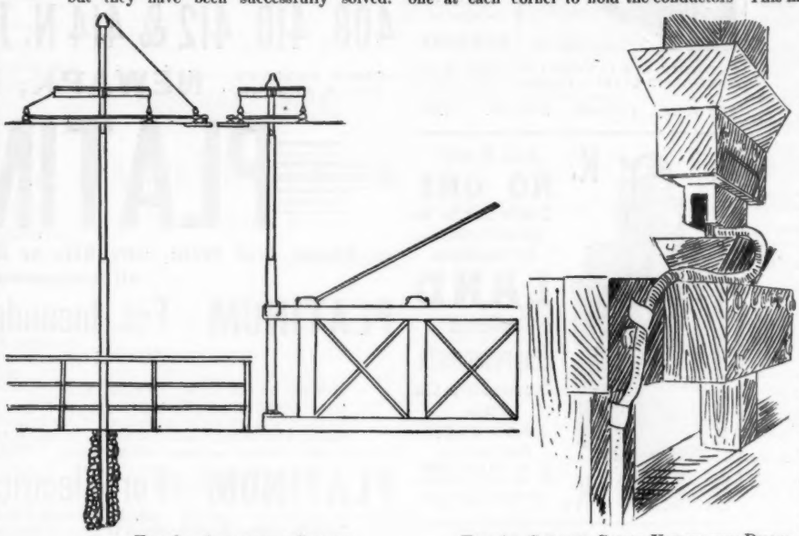


FIG. 3.—AUTOMATIC SWITCH.

FIG. 4.—SPECIAL CABLE UNDER THE DRAW

FIG. 2.—WEST END ELECTRIC RAILWAY, BET. BOWDOIN SQUARE, BOSTON, AND HARVARD SQUARE, CAMBRIDGE, MASS.

—— The entire plant of the Excelsior Electric Light Company, of Orange, has passed into the possession of the Essex Electric Light Company, which is composed of residents of Orange. The following are the officers of the new company: President, Edward E. Sage; secretary, Charles A. Lindsley; treasurer, William B. Boulton; general manager, Stuart Lindsley; directors, George Grary, E. E. Sage, C. G. Kidder, C. A. Lindsley, Stuart Lindsley, Stephen D. Day, William B. Boulton.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING FEBRUARY 26, 1889.

398,045 Apparatus for bleaching by electrolysis; Eugene Hermite, Edward J. Paterson and Charles F. Cooper, London, England.
398,075 Secondary battery; Johannes T. Pederson, New York, N. Y.
398,121 Equalizer for electric currents; Sigmund Bergmann, New York, N. Y.
398,122 Static induction generator; Edward T. Birdsall, New York, N. Y.
398,132 Galvanic battery; Eben D. Cross, Chicago, Ill.
398,144 Door spring connection for electric burglar alarms; John Geary, Philadelphia, Pa., assignor to Shaw & Geary, same place.
398,194 Secondary battery; Illins A. Timmis, 2 Great George street, Westminster, County of Middlesex, England.
398,272 Element for thermo-electric batteries; Max Mestern, Turin, Italy.
398,276 Automaton; Arthur M. Pierce, Lyndhurst, N. J.
398,288 Switch for electric circuits; Clarence S. Stirling, Hartford, Conn., assignor to Charles E. Dustin, same place.
398,294 Cable railway system; Charles J. Van Depoele, Lynn, Mass.
398,327 Electric spray producing apparatus; Hilarion A. B. Huguet de Vars, Paris, France.
398,353 Semaphore signal; Frederick Stitzel and Charles Weinedel, Louisville, Ky., assignors to the American Semaphore Company, same place.
398,402 Current collecting device for electric railway; Rudolph M. Hunter, Philadelphia, Pa.
398,420 Electric burglar alarm; Lawrence A. McCarthy, Brooklyn, N. Y.
398,457 Alternate current electric motor; Oliver B. Shallenberger, Rochester, assignor to the Westinghouse Electric Company, Pittsburgh, Pa.
398,458 Alternate current electric motor; Oliver B. Shallenberger, Rochester, assignor to the Westinghouse Electric Company, Pittsburgh, Pa.
398,489 Support for electric railway wire; Thos. H. Brady, New Britain, Conn.
398,510 Electric switch; Warren S. Hill, Boston, Mass.
398,560 Electric switch; Franklin A. Weller and Adolph F. Reitzel, Lynn, Mass.
398,561 Electric switch; Franklin A. Weller and Adolph F. Reitzel, Lynn, Mass.
398,566 Electric cut-out; Wm. H. S. Wright, Kansas City, Mo.
398,577 Electric brake for railway trains; Alexander H. Bowman, Packerton, Pa., and Watson P. Widdifield, Uxbridge, Ontario, Canada, assignor to said Widdifield, Anson Todd Button, Uxbridge, and Samuel Street Fuller, Stratford, Canada.
398,613 Electric railway signal; Horace Hayden, Jr., and Wm. F. Z. Desant, New York, N. Y., assignors of one-third to Albert R. Gording, same place.
398,661 Insulating support for electrical conductors; Sidney H. Short, Columbus, Ohio.

REISSUES.

10,986 Electric discharge device; Reginald Belfield, Pittsburgh, Pa., assignor to the Westinghouse Electric Company, same place.

NOTICE is hereby given that the co-partnership heretofore existing between J. ELLIOTT SHAW and JOHN GEARY, under the name of SHAW & GEARY, is this day dissolved by mutual consent. All bills due and owing by said firm will be paid by J. ELLIOTT SHAW, and all accounts due the said firm are receivable only by him.

J. ELLIOTT SHAW.
JOHN GEARY.

The Electrical Manufacturing business will be continued at No. 53 North Seventh Street, under the name of J. ELLIOTT SHAW & CO.

PHILADELPHIA, February 11th, 1889.

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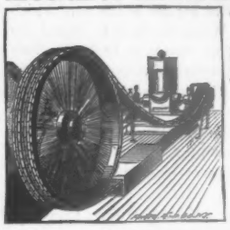
Leather Link Belt Co.



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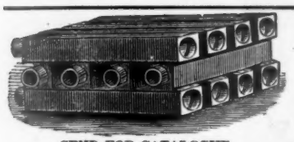

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In purity and hardness, which are the important requirements for perfect contact points in keys, relays, transmitters, etc., we find it to be A1.
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DURAND & Co., Jewelers, 44 East 14th Street,
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PLATINUM—For Chemical Apparatus.

RICHARDS & Co., Chemical and Physical Apparatus,
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DEAR SIRS:—We are glad to say that the Platinum we have bought from you for the past eight years has been in every way satisfactory. We have used your Metal in making Chemical Apparatus of all kinds, and have never had a complaint. We would also say that your price for Scrap has always been satisfactory. Yours truly, RICHARDS & CO.

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GENTLEMEN:—After using your Platinum wire for several years it gives us pleasure to assure you that it is perfectly satisfactory.
Yours truly, MABIE, TODD & BARD.

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Newark, N. J., Jan. 23d, 1889.
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GENTLEMEN:—We take great pleasure in recommending your Platinum in its various forms. We have now used it for several years and can say it gives us great satisfaction. Having to use it in Sponge Wire and Plate form, we can heartily endorse it. Yours most truly,
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ALEX. MILNE, President.

Native & Scrap Platinum Purchased.
Pure Aluminium in Sheet & Wire for Electrical Purposes.

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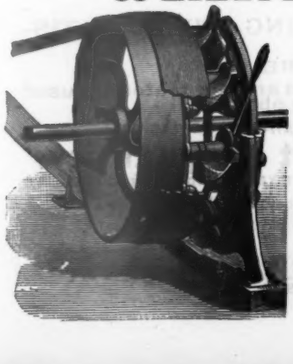

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Gentlemen:—You can refer to our machines as satisfactory. Yours truly,
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(Working with belt driving Double Acting Gas Compressor with pressure of 550 lbs. to sq. inch.)

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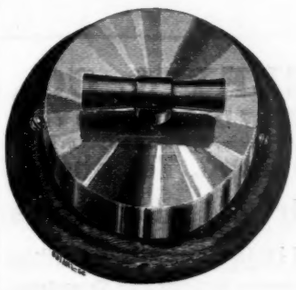
Gentlemen:
Your Belt-Shifter is on a dynamo pulley and I am convinced that it is a good thing. Yours truly,
ALFRED DOLGE.



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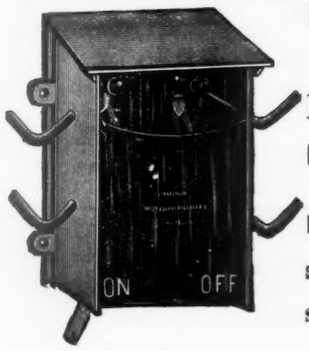

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In the many suits brought by the Edison Company, in the lower courts, against infringers of the Edison Patents, the defendants have evaded the MERITS of the controversy, thus tacitly admitting the fact of infringement, and have interposed a plea alleging that our Patents have been voided by the expiration of Patents previously granted in foreign countries.

Hence the delay in establishing our rights. In the meantime other electrical companies have been indiscriminately copying our devices and methods, not even assuming that they themselves were the original inventors, but simply relying upon the construction of a statute by the lower courts invalidating our fundamental Patent. In pursuance of our expressed determination to secure a decision upon the point of law involved, we have had the Bate Refrigerator case (covering the identical question) argued before the United States Supreme Court, with the result announced above, thus

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TO USERS OF INCANDESCENT LAMPS:

The Edison Electric Light Company has recently been flooding the country with advertisements, circulars and legal notices to the effect that the Supreme Court of the United States has sustained its patents, and that it now had a monopoly of the electric lighting business, and had only to prove the possession by others of an incandescent plant or apparatus made by some other company to enable it to collect damages from the owner, and enjoin him from its further use. Nothing could be more false and misleading than these statements, and nothing more unworthy and disingenuous than their application.

The following are the facts:

1. The case decided by the Supreme Court was on the Bate Refrigerator patent which has nothing to do with electric lighting.

2. No Edison patent has ever been passed upon by the Supreme Court.

3. The point decided was that an American patent for an invention previously patented abroad does not expire until the foreign patent ceases to exist.

4. Some of the Edison patents are for inventions which were previously patented abroad for short terms. The U. S. Circuit Court in New York had decided that these patents expired when the short terms of the foreign patents ran out, notwithstanding the fact that such terms had been extended. The only advantage of the Bate decision to the Edison Company is that it can go on with the suits on such patents where it can prove that it has extended its foreign patents in time. In such cases the defendants can put in the real defences and try the cases on their merits. Most of the Edison suits were begun in 1885. Not one of them was ever brought to a hearing. The testimony has not been closed in any of them. No Edison patent has ever been sustained in America. Many of its best patents have expired by reason of the actual expiration of prior foreign patents. It has no patent upon which it can obtain a preliminary injunction; nor has it any patent on which it can obtain a final injunction or collect damages from customers of this Company when the real defences are put in, as they certainly will be.

5. Every Edison Lamp is an infringement of the Sawyer-Man patent No. 317,676, dated May 12, 1885, which was granted after a four years interference with Edison in the Patent Office, and every treated Edison lamp is an infringement of the Sawyer-Man patent No. 211,262, and Edward Weston's patent No. 306,980, and every user of such Edison lamps is liable to the Consolidated Electric Light Company and the United States Electric Lighting Company for damages for such use.

6. Every Edison plant is an infringement of the Moses G. Farmer System patents, and every user of such plants is liable to the U. S. Electric Lighting Company for damages for such use.

7. The Edison Company has been sued on these patents, and the suits are being pressed vigorously.

8. The lamps made and sold by the Sawyer-Man Electric Co. and the United States Electric Lighting Co. are made by license under the Sawyer-Man patents.

This Company agrees to defend and guarantee all of its users against damages in any and all suits brought against them by the Edison Company for the alleged infringement of any of its patents, where it is promptly notified of such suits, and permitted to defend them.

It is suggested that the course of the Edison Co. in attempting to annoy and intimidate the users instead of proceeding against the manufacturers of competing apparatus, while quite in line with the character of its statements, will hardly commend itself to the approbation of the public.

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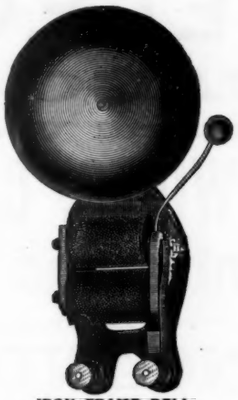
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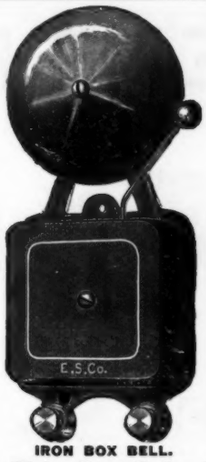

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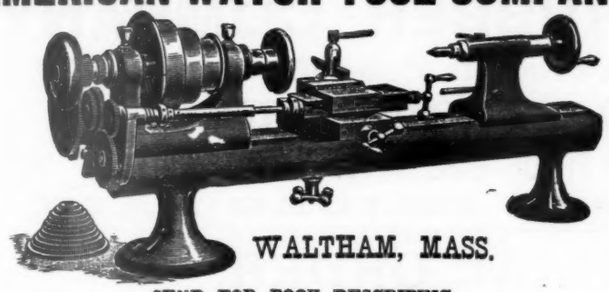

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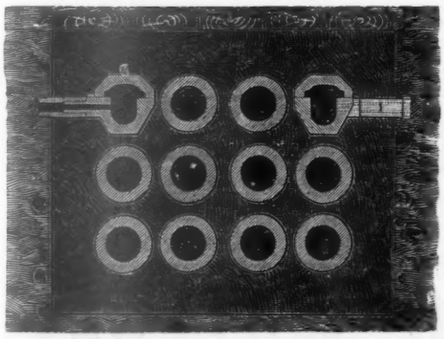

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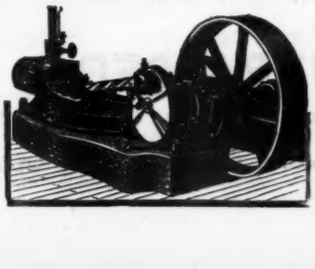

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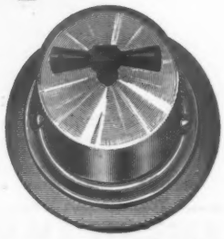

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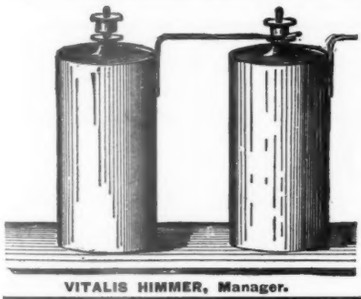

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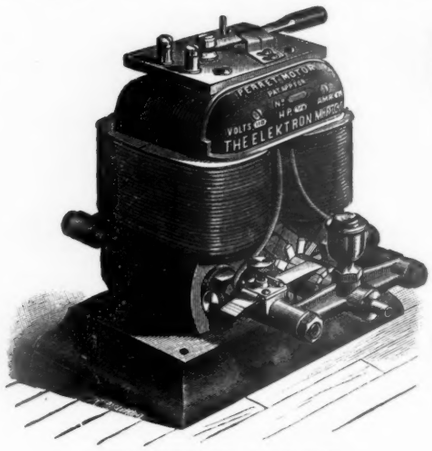

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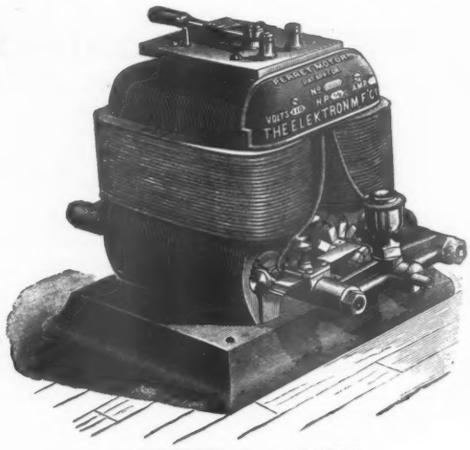

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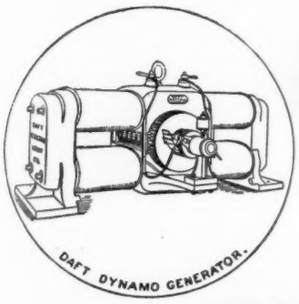

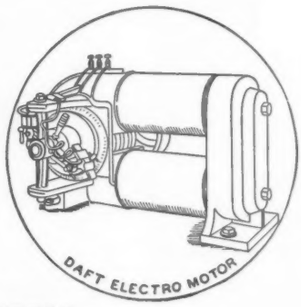

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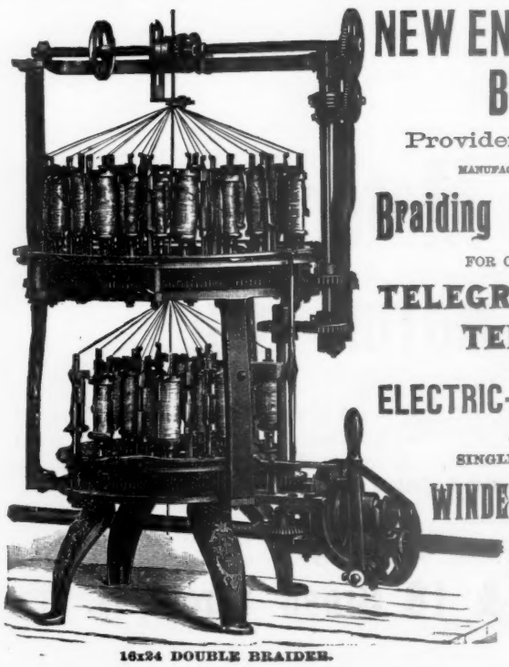

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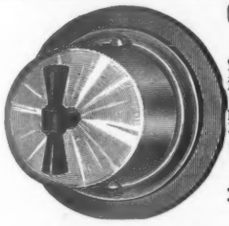

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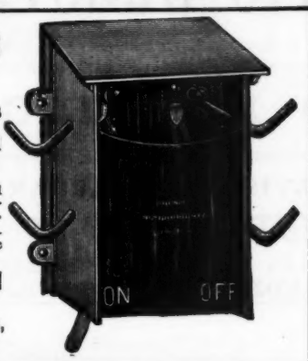

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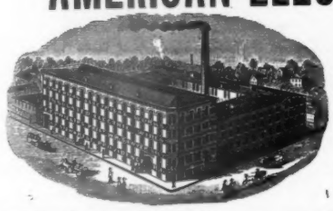

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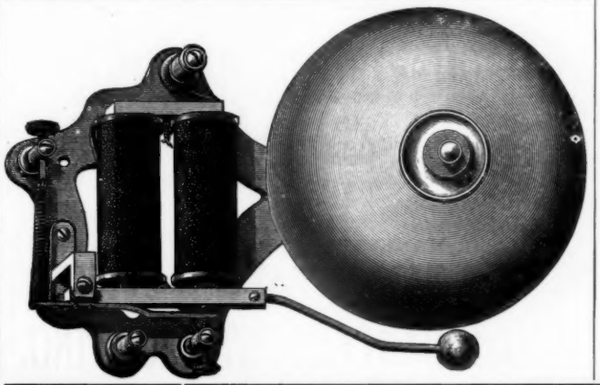

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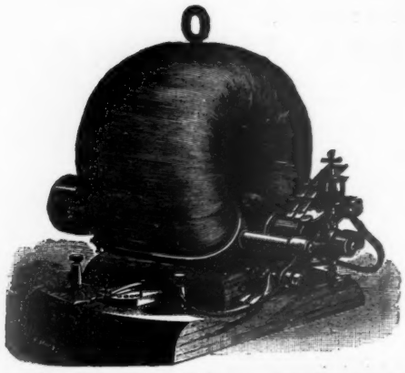

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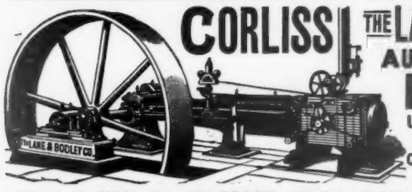

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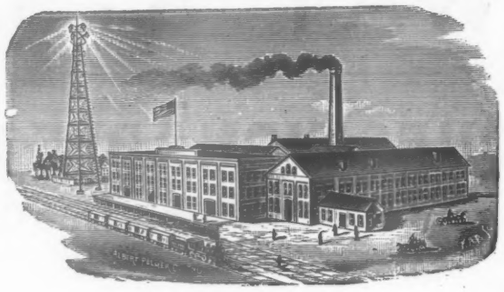

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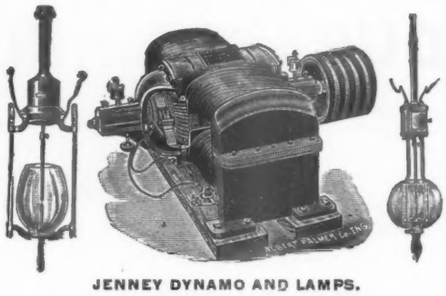

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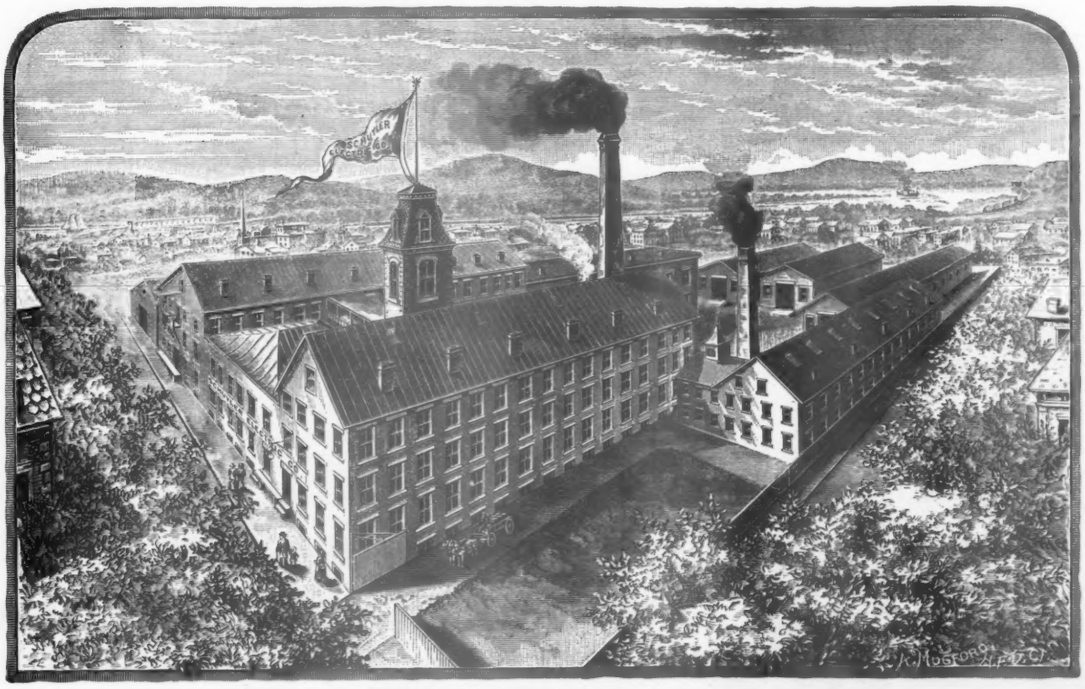

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